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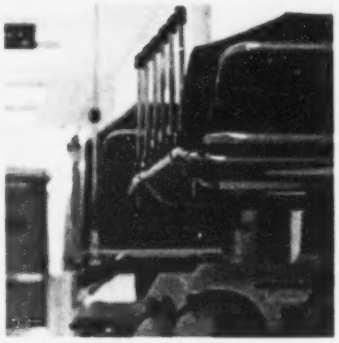
Mental comorbidity and its contribution to increased use of acute care hospital services



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The Longitudinal Health and Administrative Data (LHAD) Initiative is a partnership among provincial and territorial ministries of health and Statistics Canada, as well as the Canadian Institute for Health Information (CIHI), the Canadian Council of Cancer Registries and the Vital Statistics Council for Canada. The objective of the Initiative is to address important information gaps by ensuring that key administrative data, such as those routinely collected through the health system, can be used to undertake pan-Canadian research to improve the understanding of relationships among risk factors, socio-economic characteristics, health status measures and health care utilization. The research involves the linking of provincial and territorial health administrative data within themselves, and with Statistics Canada population health survey data, the births and deaths databases, and the Canadian Cancer Registry. In addition to complementing the important record linkage research already being done within individual provinces, LHAD studies create invaluable opportunities to learn from comparisons among jurisdictions, as well as facilitate larger studies for less common types of events and conditions. In short, the LHAD Initiative is intended to establish the foundation for a Canadian record linkage program to help further the advancement of knowledge about health determinants, outcomes and their relationships.

Statistics Canada is the operational arm of the LHAD partnership. Two divisions within Statistics Canada—the Health Statistics Division (HSD) and the Health Analysis Division (HAD) collaborate in supporting the Initiative.

HSD is responsible for ongoing administrative support including organizing Steering Committee meetings and providing secretariat services to the Initiative. It is also responsible for building and maintaining the LHAD data processing environment, securely storing and processing LHAD datasets, and producing linked analysis files for all approved studies.

HAD provides research support to the LHAD program via the LHAD Research Team. HAD is the primary source of health research within Statistics Canada. Its mandate is to provide high quality, relevant and comprehensive information on the health status of the population and on the health care system. This project represents one of four research studies undertaken by the LHAD Research team from the research agenda developed by the LHAD Steering Committee in 2008.

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The analyses and conclusions in this report do not necessarily reflect those of the individual provincial representatives or their respective ministries of health.

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Executive summary

About one in five Canadians have suffered from a mental condition at some point in their lives. Like other health conditions, mental conditions represent an economic burden to society, and costs are often comparable to physical conditions such as heart disease. Expenditures on mental conditions and addictions for Canadian provinces in 2003/2004 were $6.6 billion, of which $5.5 billion was from public sources.

Major psychiatric conditions are often associated with physical comorbidity—in particular, diabetes, cardiovascular disease, high blood pressure and respiratory conditions. Reasons for this association are diverse, and not fully understood. Many health conditions increase the risk for a mental condition. Mental comorbidity can complicate help-seeking, diagnosis, and treatment, and it influences prognosis. Hence understanding the burden of mental conditions as a comorbid condition among those with physical morbidities is important.

This report represents an assessment of a comprehensive set of factors associated with acute-care hospitalizations for mental conditions in Canada. The first part explores the overall burden of a mental condition as the most responsible condition (the condition considered most responsible for the hospitalization) and as a comorbid condition (a diagnosed condition other than the most responsible for the hospitalization) in acute-care hospitals in Canada. It presents the number of hospitalizations, the number of hospital days and the average length of stay of a hospitalization. In the second part, linked health survey and hospital data are used to describe the socioeconomic and lifestyle factor characteristics of patients who were admitted to an acute-care hospital with a mental condition within four years after responding to the survey.

Key findings

Part 1: Understanding the burden of mental conditions on acute-care hospitalizations

- Those who were discharged at least once from an acute-care hospital with a diagnosed mental condition represent 1% of Canadians but 14.7% of hospitalized individuals.
- Altogether hospitalizations at an acute-care hospital by people with a diagnosed mental condition accounted for 29% of hospital days: 12.4% (2.5 million) of hospital days were associated with a most responsible diagnosis of a mental condition and 16.6% (3.3 million) of hospital days were associated with a comorbid diagnosis of a mental condition.
- On average, the length of stay for hospitalizations with a comorbid diagnosis of a mental condition is twice as long compared with those admitted without one. This finding is consistent across ages, provinces and major disease types.
- Hospitalizations with a most responsible diagnosis of a mood, psychotic or organic (dementia, delirium) condition contain a high number of hospital days, as do hospitalizations with a comorbid diagnosis of an organic, substance or mood mental condition.
- Variations across provinces and health regions were noted. Some variations reflect potential differences in diagnostic coding practices.

Part 2: Characteristics of individuals admitted to acute-care hospital with a mental condition

- Results of the linked survey and hospital data reveal significant differences in the socioeconomic and lifestyle factors of those who experienced a hospitalization with a diagnosis of a mental condition (most responsible or comorbid) compared with those hospitalizations who did not.
- Those in lower income groups and those with less than a high school education were at higher risk of hospitalization with a diagnosis of a mental condition.
- Smokers were more likely to experience a hospitalization with a diagnosis of a mental condition compared with non-smokers.
- Those single (never married), separated/divorced or widowed were at higher risk of hospitalization with a diagnosis of a mental condition than those who were married.
- Those admitted to hospital with a documented mental condition were more likely to have had chronic physical conditions and disability.
- Those who are hospitalized with a diagnosis of a mental condition were more likely to report an unmet health care need compared with those who were not hospitalized.

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Introduction

About one in five Canadians have suffered from a mental condition at some point in their lives.[1,2,3] About 14% of the global burden of disease has been attributed to neuropsychiatric conditions, mostly because of the chronically disabling nature of depression and other common mental conditions, alcohol-use and substance-use conditions, and psychoses.[4] Studies by the World Bank and World Health Organization suggest that, among non-communicable diseases, depression is estimated to be the third highest reason for healthy years of life lost for women and the fifth highest cause for men.[5] Organizations around the world have identified mental health as a priority area.[6,7]

Like other health conditions, mental conditions represent an economic burden to society with costs often comparable to physical conditions such as heart disease.[8,9] Expenditures on mental conditions and addictions for Canadian provinces in 2003/2004 were $6.6 billion, of which $5.5 billion was from public sources.[10] Nationally, the largest portion of expenditures was for hospitals, followed by community mental health expenses and pharmaceuticals. Even with these amounts, Canadian public spending on mental health was found to be lower than in most developed countries.[10]

There also appears to be an inadequate appreciation of the burden of mental conditions on physical well-being and that there can be "no health without mental health."[4] Hence, understanding the burden of mental conditions as a comorbid condition among those with physical morbidities is important. Many major psychiatric conditions are observed with physical conditions.[11] The prevalence of several chronic physical conditions, namely, chronic pain, diabetes, cardiovascular disease, high blood pressure and respiratory conditions is higher among people with mental conditions.[12,13,14] Reasons for the excess rates of mental conditions among those with physical morbidities are diverse, and not fully understood. Many physical health conditions increase the risk for poor mental health, and mental comorbidity often complicates help-seeking, diagnosis and treatment, which may influence prognosis.[4]

Regardless of the causal pathway, the combination of physical and mental conditions often results in higher rates of healthcare use. Higher rates of emergency room and outpatient services and pharmaceuticals expenditures, for example, were found among chronically ill individuals with mental conditions compared with those with physical morbidities alone.[15] Specifically, among diabetics, higher health care expenditures were associated with mental conditions, including substance use disorders.[16] Those with mental conditions may also be at risk because of drug interactions between general medical drugs and psychotropics.[17]

A recent review of mental health services in Canada conducted by the Standing Senate Committee on Social Affairs, Science and Technology concluded that Canada currently has no national picture of the status of mental health across the country. It concluded that more information is necessary to determine the extent of the problem and to plan and implement necessary services and programs.[18,19] The Public Health Agency of Canada has voiced similar concerns, stating that the profile of mental conditions is very limited in Canada, and that there is a need to complement available hospitalization data with additional data, to provide a more comprehensive understanding of the patients currently accessing the healthcare system for mental health services and of the comorbidity of mental conditions with other illnesses.[20,21]

There has been an increase in population-based studies of mental health at the national[22,23,24,25,26] and provincial level.[27,28,29] However, significant gaps remain in our understanding of the extent of the burden and of the patient profile of individuals admitted to an acute-care hospital with a diagnosis of a mental condition. For example, most of these reports regarding hospitalizations focus on mental conditions as a most responsible diagnosis and provide limited information regarding the burden of mental conditions as comorbidities. Furthermore, much of the administrative health data provide limited information regarding the characteristics of individuals admitted to hospital with a diagnosis of a mental condition. This information is critical to our understanding of the burden of service use placed by these individuals.

This report builds upon the emerging picture of the burden of mental conditions using a range of data sources available to Statistics Canada. Part 1 of the report focuses on the burden of mental conditions in acute-care hospitals using administrative hospital data. We consider a more expansive role of mental health by looking at both hospital admissions where a mental condition is reported as the most responsible diagnosis as well as those admissions where a mental condition is reported as a comorbid diagnosis. This enables a more comprehensive assessment of the impact of mental conditions on hospital resource use. The number of days and the average length of stay, rather than the number of hospitalizations, are presented to look more closely at use issues.

Part 2 of the report focuses on understanding the characteristics of patients admitted to hospital with a mental condition, reported as most responsible or comorbid diagnosis. We use linked data to identify patient characteristics associated with hospitalization with a diagnosis of a mental condition. This information provides some insights into other patient factors that may be contributing to the increased use of resources.

Data sources

Hospitalization data

Statistics Canada's Hospital Person-oriented Information (HPOI) Database is a person-level dataset derived from discharge records of inpatients in most of the acute-care hospitals and some psychiatric, chronic and rehabilitation hospitals across Canada.[30] The database excluded newborns, patients not resident in a Canadian province and those without a usable patient identification number. For 2003/2004, 13% of the records were excluded, of which 81% were for newborns. The database includes information on date of admission and separation, up to 25 International Classification of Diseases (ICD)-9 diagnoses identifying the reason(s) for the hospitalization and up to 20 procedure codes indicating interventions received during the course of the hospitalization based on ICD-9/10 codes.[31,32,33,34] The discharge records contain demographic (gender, date of birth, postal code), administrative (health number, admission and separation dates) and clinical information derived from the Hospital Morbidity Database (HMDB) maintained by the Canadian Institute for Health Information (CIHI).[35] During data processing at Statistics Canada, about 3% of HMDB records for patients aged 12 and older were excluded because of missing or invalid health numbers. The HPOI represent approximately 2.7 million acute-care hospitalizations each year.

Only records in the HPOI database that pertained to patients who were discharged during fiscal year 2003/2004 were used. Fifty-nine records with missing admission or separation dates were excluded, and the 23 records with missing sex were excluded. The number of records used for this analysis was 2,711,533.

Health region information was added to the HPOI from the 2006 Census. Postal codes were first converted to census geographic units using the Statistics Canada postal code conversion file, and then linked to health regions based on the correspondence file between health regions and their component census geographic units.[36,37] Census linkages were created at the dissemination area (DA) level and block level for British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario (Local Health Integration Networks, [LHINs]). Even these smaller geographic areas (DA/blocks) sometimes straddle health region boundaries. In those cases, the entire DA or block was assigned, in conjunction with the affected province, to just one health region and therefore represents a 'best fit' with census geography.

Methods

Descriptive statistics (proportions, averages) were generated using SAS version 9.1.3 (Cary, NC), particularly PROC FREQ and PROC MEAN.

Definitions

Diagnosis of a mental condition

The International Classification of Diseases, 10th Revision (ICD-10), defines a mental condition as "the existence of a clinically recognizable set of symptoms or behaviour associated in most cases with distress and with interference with personal functions."[38]

To identify mental diagnoses, we used the same ICD-9 and ICD-10 codes currently used by the Canadian Institute for Health Information (see Table 1 below for definitions and Appendix Table A for codes[23]). This approach reflects the way mental conditions are viewed today.

The diagnostic data from the provinces was extracted using the classification system in which the data were collected in the first place: either the ICD-9 (ICD-9 and ICD-9-CM) or 10th revision (ICD-10-CA) was used as appropriate.[31,32,33,34] Each hospitalization gives a "most responsible diagnosis"—the condition that was most responsible for the hospitalization. Diagnoses of mental conditions other than the most responsible were considered to be comorbid mental conditions. A maximum of 25 diagnostic codes were examined.

Table 1
Mental disorder groupings and specific conditions

Mental disorders	Mental conditions
Organic disorders	Dementia, delirium, mental or personality disorder due to brain injury or damage
Substance-related disorders	Alcoholic or drug psychoses, alcohol or drug dependence, non-dependent drug abuse
Schizophrenic/Psychotic disorders	Schizophrenia, psychosis, paranoia
Mood disorders	Bipolar, depression, other
Anxiety disorders	Anxiety, acute stress
Personality disorders	Personality disorders
Other disorders	Adjustment, sexual, delusional disorders, disturbance of conduct, not otherwise specified non-organic psychoses, all other psychiatric disorders

Source: Canadian Institute for Health Information, *Hospital Mental Health Services in Canada, 2005-2006* Ottawa 2008, p. 27-28.

Hospitalization

A hospitalization is represented by one hospital record. A record is generated any time a patient leaves because of death, discharge, sign-out against medical advice or transfer. The number of hospitalizations is the most commonly used measure of the utilization of hospital services: it has been used to determine the burden of a disease. Hospitalizations, rather than admissions, are used because hospital abstracts for inpatient care are based on information gathered at the time of discharge. Hospitalizations do not include any outpatient visits. In the literature, some articles refer to hospitalizations as separations, stays or visits.

Length of stay

Length of stay (LOS) is the number of hospital days used within a hospitalization and is a proxy measure of the use of hospital services. LOS is defined as the number of days between the date of admission to hospital and date of discharge. If the patient was admitted and discharged the same day, the LOS set to 0.5.

Findings

Part 1: The burden of use of hospital services with a mental diagnosis

Hospital services for those with a diagnosis of a mental condition

Rates of acute-care hospitalizations with a diagnosis of a mental condition

In 2003/2004, the total number of hospitalizations with a most responsible diagnosis of a mental condition was 155,000, representing 5.7% of all hospitalizations in that year. The number of hospitalizations with mental conditions listed as a comorbid diagnosis totalled 228,000, representing 8.4% of all hospitalizations. Looking at the percentage of hospital days, 12.4% (2,471,000) were associated with hospitalizations reporting a most responsible (MR) mental diagnosis, and 16.6% (3,306,000) with hospitalizations reporting a comorbid mental diagnosis.

In Canada, those who experience a hospitalization with a diagnosis of a mental condition make up a relatively small proportion of the overall population but use a disproportionately large share of hospital services. In 2003/2004, approximately 291,000 people, 0.9% of all Canadians, were discharged at least once from an acute-care hospital with either a most responsible or comorbid mental diagnosis. These individuals, however, represented 14.7% of all individuals who were discharged from hospital during that year.

Individuals with a mental condition used a disproportionate amount of hospital resources: 14.1% of all hospitalizations and 29.0% of hospital days (5.8 million hospital days) (Figure 1).

To obtain a comprehensive assessment of the burden of mental conditions on acute-care hospitalizations, we clearly need to consider the role of mental conditions both as a most responsible and as a comorbid diagnosis.

Findings by age and sex

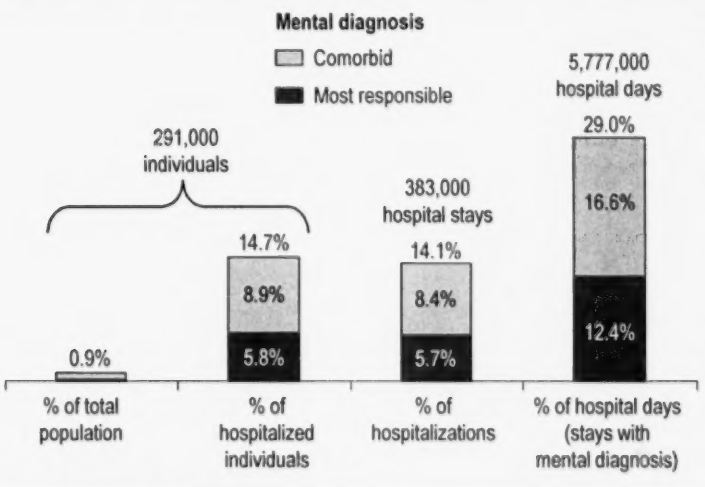
Distributions by age and sex tell us more about who is using hospital days associated with diagnoses of a mental condition (figures 2a and 2b). While women use more hospital days overall (55.1%), the percentages within each sex associated with most responsible or comorbid diagnoses of a mental condition were similar (most responsible 12.1% for males vs. 12.7% females; comorbid 17.1% for males vs. 16.2% females). The overall pattern across ages is similar for males and females (Figure 2a).

As expected, the number of days associated with comorbid mental diagnosis increases with age. The number of most responsible days in hospital associated with a mental diagnosis was spread out across all ages and had a slight increase in the thirties and forties. The percentage of most responsible days in hospital associated with a mental diagnosis decreases with age (the dip in female percentages is due to childbirth). For young males, over 30% of their hospital days were associated with a most responsible mental diagnosis. The percentage of days in hospital associated with a comorbid mental diagnosis increases with age for both sexes (Figure 2b).

The average length of stay for hospitalizations with and without a mental diagnosis provides an indication of the intensity of hospital service use. As expected, the average length of stay of hospitalizations with a mental diagnosis (either most responsible or comorbid) is greater than for those hospitalizations with no mental diagnosis (Figure 3). The average length of stay is for hospitalizations with a most-responsible mental diagnosis is 15.9 days; for a comorbid mental-condition diagnosis, 14.5 days, and for no mental diagnosis, 6.1 days (Figure 3).

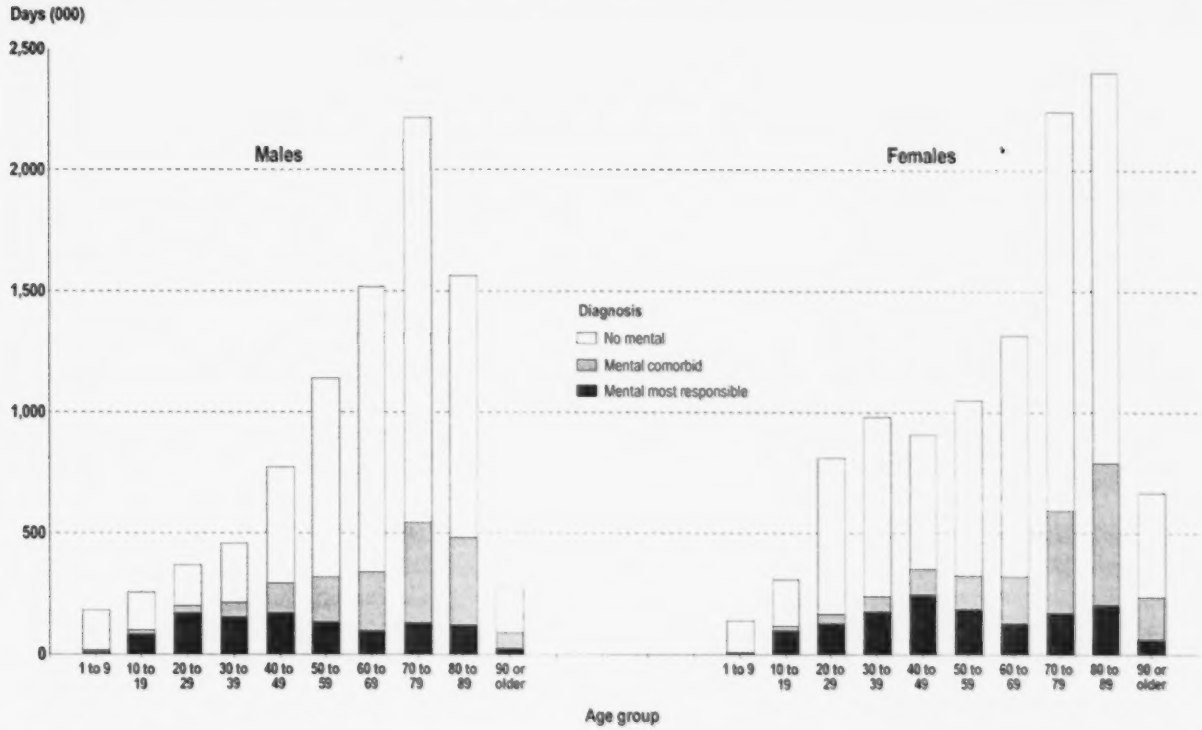
Within each age group, the average length of stay was often more than three times as long

Figure 1
Characteristics of acute care hospitalizations associated with mental diagnoses, Canada, 2003/2004



Note: See data sources for exclusions.
Source: 2003/2004 Hospital Person-Oriented Information.

Figure 2a
Total number of hospital days, by presence of mental diagnosis, by sex and age group, Canada, 2003/2004



Source: 2003/2004 Hospital Person-Oriented Information.

for hospitalizations with a most responsible mental diagnosis compared with hospitalizations where no diagnoses of a mental condition was reported. The average length of stay for hospitalizations with a comorbid mental diagnosis was in between, but still more than twice as long as the average for hospitalizations with no diagnoses of a mental condition (ratio=2.3) for all ages. For example, among those aged 60 to 69 years, the average length of stay was 20.6 days for hospitalizations with a most responsible mental diagnosis, 14.2 days for a comorbid mental diagnosis and only 7.1 days for hospitalizations with no mention of a mental diagnosis.

Findings by type of mental diagnosis

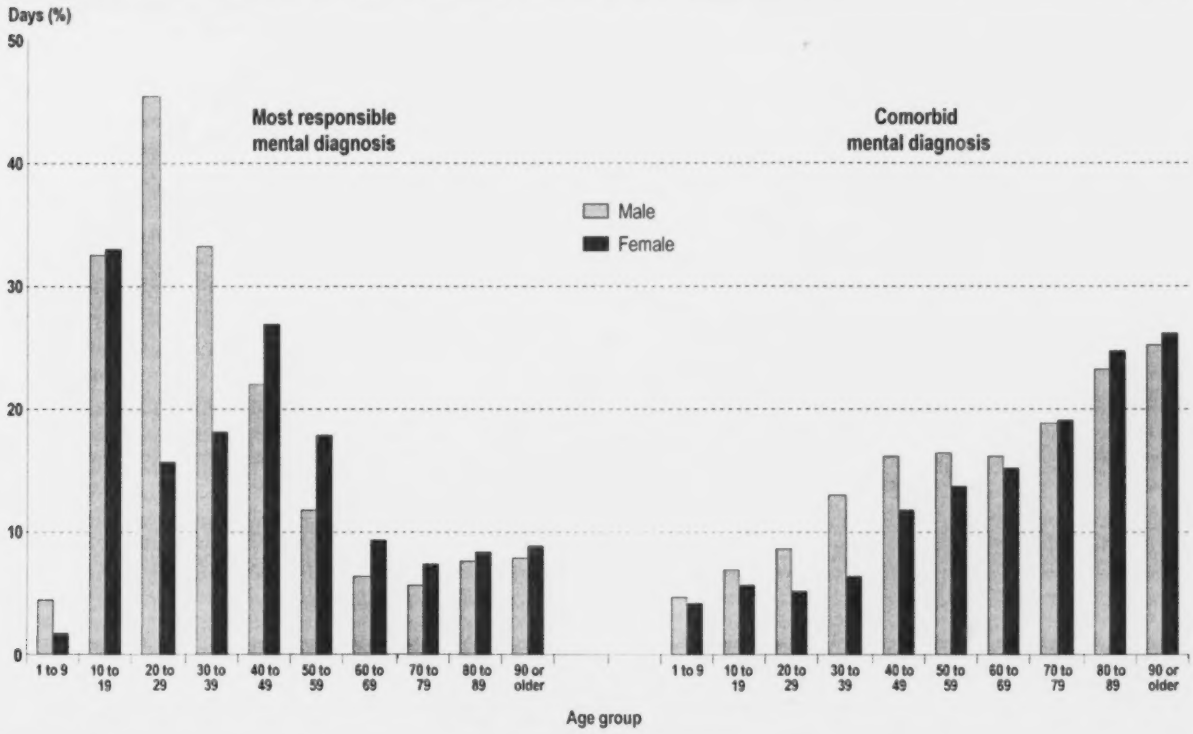
It is also informative to look at the burden of hospitalization associated with each type of mental condition by various age groups (Figure 4). Based on these results, the most prevalent comorbid types of mental conditions were organic (dementia, delirium), substance-related and mood conditions. As expected, organic mental comorbidity (dementia, delirium) was most prevalent among those over 70 years of age. Substance abuse was prevalent over a wide range of ages, mostly as a mental comorbidity. Mood conditions first appear as a most responsible diagnosis at young ages and then shift to comorbid conditions as age increases. Schizophrenic and psychotic conditions occur most often as a most responsible diagnosis for those aged 20 to 60 years. Anxiety and personality conditions were found as mostly comorbid conditions across most ages.

Findings by province and health region

Hospitalizations with a mental diagnosis, by province and health region

The burden of mental conditions on acute-care hospitalizations varied across provinces (Figure 5). The proportion of hospitalizations with a most responsible mental condition ranged from 3.7% in Newfoundland and Labrador (52,580 hospitalizations) to 8.8% in Prince Edward Island (15,912 hospitalizations). The proportion of hospitalizations

Figure 2b
Percentage of hospital days associated with a mental diagnosis, by sex and age group, Canada, 2003/2004



Source: 2003/2004 Hospital Person-Oriented Information.

with comorbid mental conditions varied from less than 3.1% in Newfoundland and Labrador to a high of 15.1% in Quebec.

Variations across the provinces may reflect possible differences in either the prevalence of mental conditions within the population or in acute-care-hospital treatment practices. However, the variations may also reflect differences in coding practices specifically related to comorbidity. The average number of diagnoses per patient per hospitalization documented in the hospital data generally varies greatly from province to province: Quebec reported the highest average number of comorbid diagnoses per hospitalization; Newfoundland and Labrador and Prince Edward Island reported the lowest.[39]

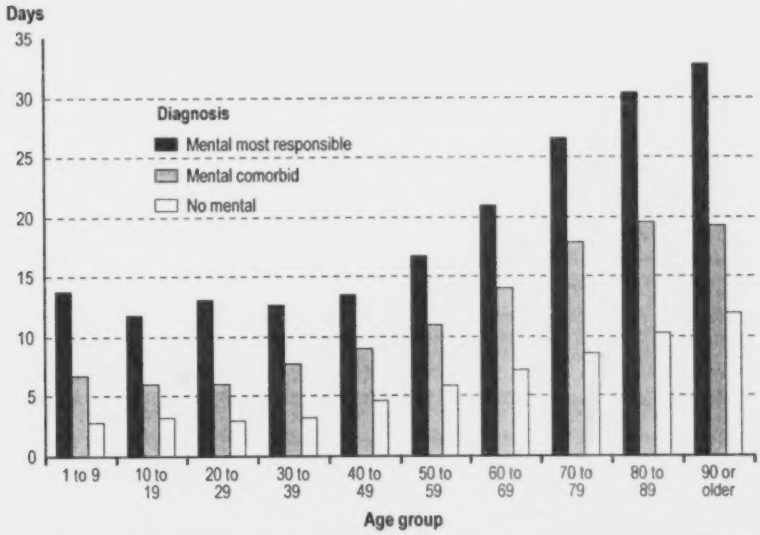
Health care planners would find it useful to consider the burden of mental conditions in smaller areas. In Figure 6, each square represents a health region. These results reveal considerable variation across health regions in hospitalizations related to mental conditions. For example, in Alberta health regions, the percentage of hospitalizations with a mental comorbidity ranges from a low of 5.0% to a high of 12.9%. Like differences across provinces, differences across health regions may be attributable to differences in underlying health states, treatment variation or even coding practices, although within a province coding differences are expected to be less of a factor. Full health region data can be found in Appendix Table B.

Hospital days associated with a mental diagnosis, by province and health region

The use of hospital days provides a proxy measure of resource use. As expected, this also varies across provinces (Figure 7). The percentage of total hospital days associated with hospitalizations with a most responsible mental diagnosis ranges from 7.3% in Saskatchewan to 12.9% in Quebec. The percentage of days associated with hospitalizations with a comorbid mental diagnosis varied from 7.1% in Newfoundland and Labrador to 25.9% in Quebec.

The results reveal considerable variation in the use of hospital days across health regions, even within provinces (Figure 8). In Alberta, for example, the percentage of hospital

Figure 3
Average length of stay, by presence of mental diagnosis and age group, Canada, 2003/2004



Source: 2003/2004 Hospital Person-Oriented Information.

days with a mental comorbidity ranges from a low of 8.9% to a high of 24.9%. To identify health regions, see Appendix Table B for health region data.

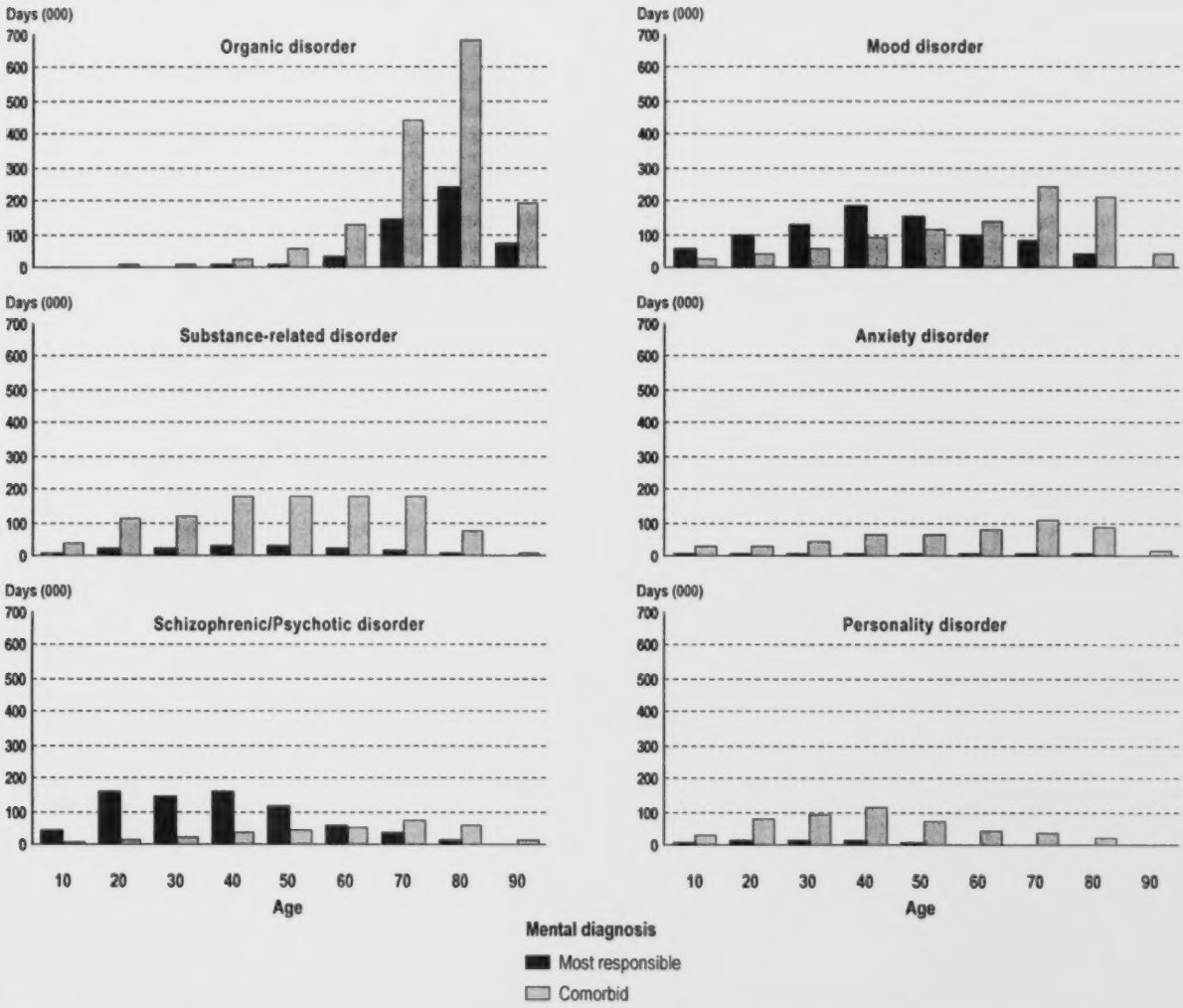
We investigated the percentage of hospital days by type of mental diagnosis to see their separate impacts on hospital utilization across provinces. Table 2 shows that higher numbers of days in hospital were associated with a most responsible diagnosis of a mood, psychotic and organic (dementia, delirium) condition. Most days in hospital associated with a comorbid mental diagnosis were for organic, substance and mood mental conditions (dementia, delirium). More that one mental condition was reported in some hospitalizations, so the total is lower than the sum. Anxiety and personality diagnoses have consistently low percentages of days across the provinces. The percentage of hospital days associated with comorbid organic diagnoses range from 2.4% in the Northwest Territories to 9.6% in Alberta. The percentage of

Table 2
Percentage of hospital days with mental most responsible or comorbid diagnosis, by province and mental disorder, all ages, Canada, 2003/2004

Mental disorder	Canada	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nvt.
Number of hospital days ('000s)	19,899	409	128	708	687	5,427	6,267	1,080	743	1,985	2,425	12	22	4
							Percentage of days							
Total														
Most responsible	12.4	8.4	10.6	10.4	12.3	14.3	10.6	13.8	7.3	12.7	14.9	10.8	16.7	5.5
Comorbid	16.6	8.3	11.7	13.7	12.9	24.5	12.0	17.2	9.9	19.5	14.0	16.2	6.3	2.4
Organic														
Most responsible	2.6	1.4	1.7	2.6	3.4	2.9	1.9	3.9	1.1	2.7	3.4	3.0	1.5	0.0
Comorbid	7.8	4.6	4.2	8.3	6.7	9.1	6.6	8.8	4.5	9.6	7.8	5.4	2.4	0.2
Substance-related														
Most responsible	0.7	0.5	0.8	0.5	0.5	0.7	0.6	1.1	0.7	1.1	0.9	1.4	3.4	0.4
Comorbid	5.1	1.6	3.1	2.9	2.5	8.8	2.8	3.8	2.9	5.7	5.3	10.2	7.8	1.7
Mood														
Most responsible	4.3	3.9	4.8	2.7	4.5	4.4	4.3	3.5	2.7	4.3	5.1	3.6	4.3	1.7
Comorbid	4.7	2.2	4.4	3.3	4.1	5.3	3.7	5.3	3.1	7.8	4.4	3.3	2.3	0.6
Psychotic														
Most responsible	3.1	0.9	1.1	3.3	2.1	3.6	2.8	3.7	1.7	2.8	4.0	1.4	5.1	1.7
Comorbid	1.6	0.3	0.8	1.1	0.8	3.3	0.9	1.8	0.7	1.1	1.1	0.5	0.6	0.9
Anxiety														
Most responsible	0.3	0.3	1.0	0.3	0.3	0.3	0.2	0.3	0.4	0.5	0.3	0.4	1.3	0.5
Comorbid	0.4	1.3	2.7	2.0	2.8	4.0	1.8	1.8	1.3	3.6	1.5	1.5	1.0	0.4
Personality														
Most responsible	0.3	0.2	0.2	0.1	0.3	0.6	0.2	0.3	0.1	0.2	0.2	0.6	0.7	0.0
Comorbid	2.2	0.4	0.8	1.3	2.3	3.8	1.3	2.0	1.2	2.9	1.6	2.3	0.7	0.6
Other														
Most responsible	1.1	1.1	1.1	0.9	1.1	1.8	0.7	1.0	0.6	1.1	1.0	0.4	0.4	1.1
Comorbid	3.0	1.5	2.1	1.5	2.3	6.6	1.4	2.7	1.3	2.3	1.5	1.3	0.6	0.3

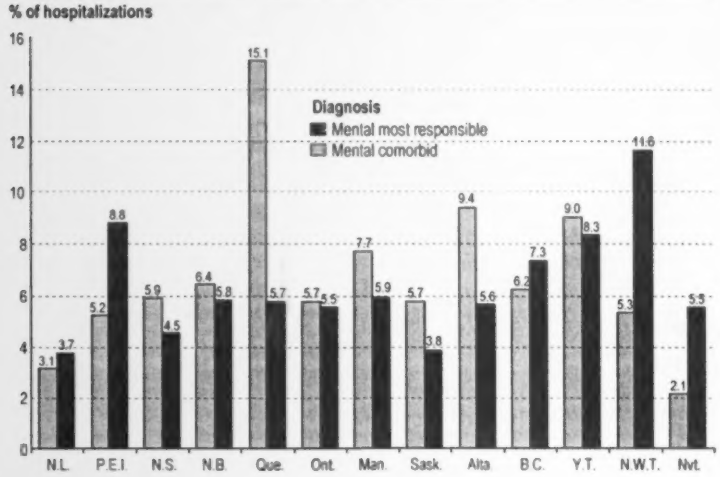
Note: The "Total" percentage is lower than the sum of the seven categories as some hospitalizations reported more than one mental condition.
Source: 2003/2004 Hospital Person-Oriented Information.

Figure 4
Age distribution of hospital days for patients aged 10 or older with mental diagnosis, by type of mental disorder, Canada, 2003/2004



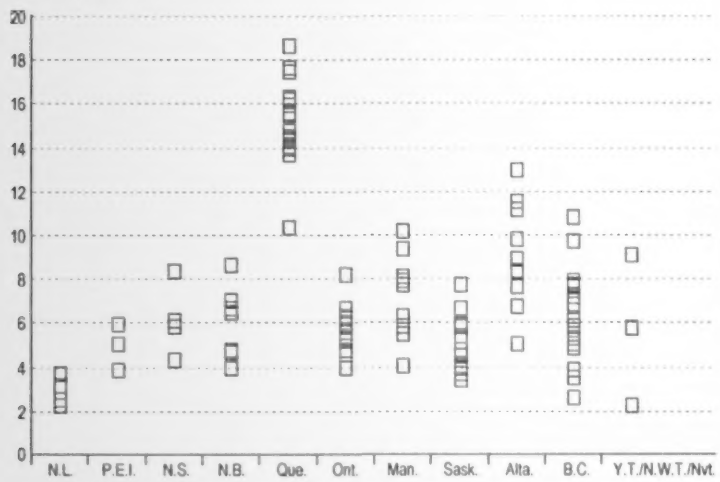
Notes: Because some stays had more than one mental comorbidity, the sum of days for all types of mental disorders exceeds the total number of days for hospitalizations with at least one mental comorbidity. Excludes 23 records with invalid sex.
Source: 2003/2004 Hospital Person-Oriented Information.

Figure 5
Percentage of acute care hospitalizations with a most responsible or comorbid mental diagnosis, by province, all ages, Canada, 2003/2004



Source: 2003/2004 Hospital Person-Oriented Information.

Figure 6
Percentage of acute care hospitalizations with a comorbid mental diagnosis, by health region and province, all ages, Canada, 2003/2004



Notes: Includes all ages but excludes 16,220 records which could not be assigned to a health region. Hospitalizations with a "Most responsible" mental diagnosis were not included. Each square symbol represents one health region. See Table B in the Annex for selected hospital information by health region.
Source: 2003/2004 Hospital Person-Oriented Information.

days associated with the mood and psychotic diagnoses vary across the provinces, while those for substance abuse are higher in the territories.

Length of stay of hospitalizations with a diagnosis of a mental condition, by province and health region

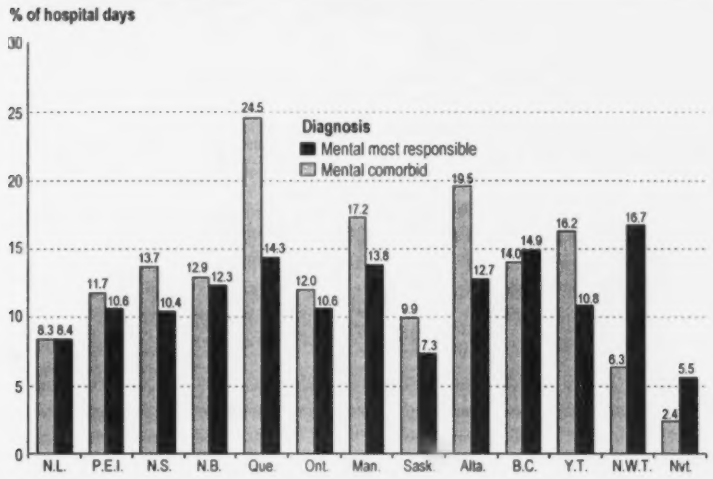
While the number of days is a proxy for the burden associated with diagnoses of a mental condition on the acute-care hospital system as a whole, the average number of days per hospitalization provides an indication of the intensity of hospital service use by patients. Comorbid diagnoses of a mental condition appear to have a significant impact on the use of hospital services during a hospitalization. The average length of stay with a comorbid mental diagnosis is two times the length of stay without any diagnosis of a mental condition. This finding is fairly consistent across the provinces. The ratio of the average number of days per discharge with a mental comorbidity to the average number of days of hospitalizations without a mental comorbidity ranges from 1.9 in Saskatchewan to 3.0 in Newfoundland and Labrador. (Figure 9, horizontal line)

Similarly, there were variations among health regions within a province in the ratio of average number of hospital days per hospitalization with a mental comorbidity to average number of hospital days per hospitalization without a mental comorbidity (Figure 10). In British Columbia for example, the ratio varies from 1.6 to more than 3.2. To identify health regions, see Appendix Table B for health region data.

Overall burden of mental conditions as a comorbid diagnosis, by major disease type

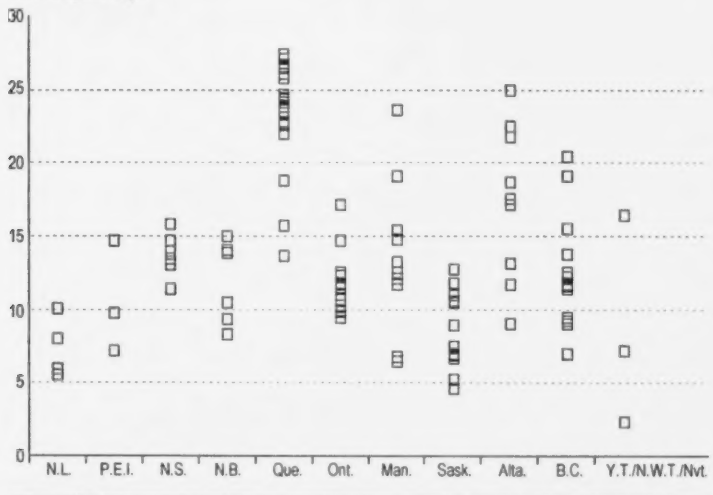
To better understand the burden of mental conditions as a comorbid condition, we looked at differences in the length of hospitalizations with and without a comorbid mental diagnosis, by major disease types. The major disease types were identified by the most responsible diagnoses for each hospitalization as defined by the ICD-10-CA chapters (Table 3). As no good crossovers exist between ICD-9 and ICD-10-CA chapters, this analysis excludes Manitoba and Quebec, as hospitalizations in these provinces were coded in ICD-9 and ICD-9-CM in 2003/2004.

Figure 7
Percentage of acute care hospital days with a most responsible or comorbid mental diagnosis, by province, all ages, Canada, 2003/2004



Source: 2003/2004 Hospital Person-Oriented Information.

Figure 8
Percentage of acute care hospital days with a comorbid mental diagnosis, by health region and province, all ages, Canada, 2003/2004



Notes: Includes all ages but excludes 16,220 records which could not be assigned to a health region. Hospitalizations with a "Most responsible" mental diagnosis were not included. Each square symbol represents one health region. See Table B in the Annex for selected hospital information by health region.
Source: 2003/2004 Hospital Person-Oriented Information.

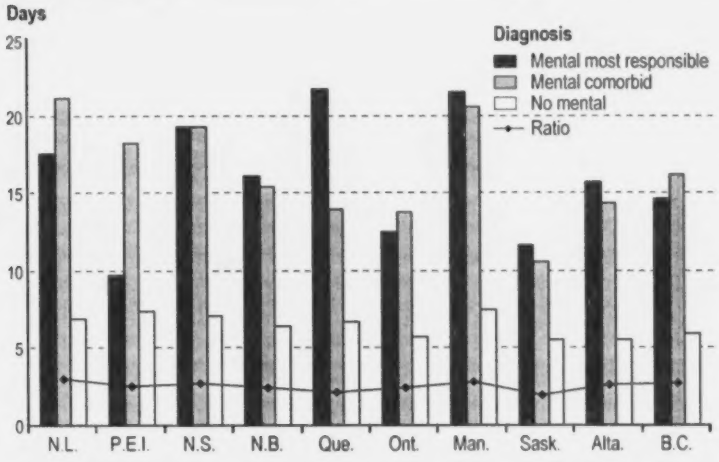
We present the percentage of hospital days with a comorbid mental diagnosis, the mean number of days per hospitalization with and without a comorbid mental diagnosis, and the ratio of length of stay (LOS) for hospitalizations with and without a comorbid mental diagnosis (Table 3). These results are presented by age group because, given the differences that we saw earlier in this report, LOS is very dependent on age. (Similar analyses using hospitalizations rather than hospital days are given in Appendix Table C.)

The share of hospital days associated with a comorbid mental diagnosis averaged 15.1% among the provinces included in this analysis. The share of hospital days associated with it ranged from 2.0% for hospitalizations related to pregnancy, to 29.2% for hospitalizations for nervous diseases. Other major disease types with a comorbid diagnosis of a mental condition of note were infectious/parasitic (20.7%), metabolic (22.4%), respiratory (18.7%), skin (18.1%) and injury/poison (21.7%).

The share of days within an ICD-10-CA chapter associated with a mental comorbidity diagnosis increased from 4.4% at age 0 to 19 to 18.5% at 65 and older. Some chapter hospitalizations were more likely to have a mental comorbidity in some age groups than others. For example, for respiratory disorders, the share of days associated with a mental diagnosis increased with age from 3.0% to 20.8%. However, within skin disorders the percentage of chapter days associated with a mental comorbidity was similar from age 20 to 65 and older. The percentage of chapter days associated with a mental comorbidity was generally low in the 0 to 19 age group.

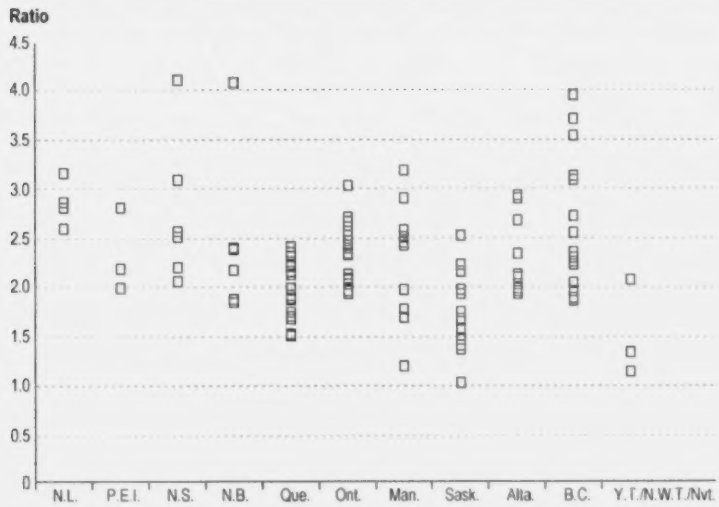
To summarize the differences in length of stay, we present a ratio between hospitalizations with and without a mental diagnosis (Table 3). The highest ratios were found for hospitalizations with most responsible conditions related to the eye (3.5) and congenital conditions (3.5). Hospitalizations with a comorbid mental condition were generally longer than those without one across all age groups. A noted exception was the eye and ear disease chapters at the youngest age grouping. Overall, there was a 2.5-fold difference in the average length of stay

Figure 9
Average length of stay, by presence of mental diagnosis and province, all ages, Canada excluding territories, 2003/2004



Note: The ratio of the average number of days per hospitalization with a mental comorbidity to the average number of days per hospitalization with no mental comorbidity.
Source: 2003/2004 Hospital Person-Oriented Information.

Figure 10
Ratio of average length of stay of hospitalizations with a comorbid diagnosis of a mental condition to those without, by health region, all ages, Canada, 2003/2004



Notes: Includes all ages but excludes 16,220 records which could not be assigned to a health region. Hospitalizations with a "Most responsible" mental diagnosis were not included. Each square symbol represents one health region. See Table B in the Annex for selected hospital information by health region.
Source: 2003/2004 Hospital Person-Oriented Information.

from a hospitalization with a mental comorbidity compared with one without. The impact of mental comorbidity was fairly consistent across age groups, with ratios ranging from 1.8 to 2.1.

Provincial breakdowns by ICD-10-CA are provided in Appendix tables D, E and F.

To further understand the burden of mental conditions as a comorbid diagnosis, we looked at the specific disease chapters by major mental diagnoses (Table 4). The percentage of hospital days for different mental conditions varies between chapters. For example, 4.9% of hospital days for skin diseases list substance abuse as comorbidity, compared with only 1.9% of hospital days for circulatory diseases. The disease chapters having more than 18% of their hospital days with a mental comorbidity were infection, metabolic, mental, nervous, respiratory, skin, injury/poison, and ill-defined. Note that the total mental is lower than the sum of the seven categories, as some hospitalizations reported more than one mental comorbidity. Similar data on hospitalizations rather than hospital days are given in Appendix Table G.

Summary

To briefly summarize Part 1, those who were discharged at least once from an acute-care hospital with a mental condition represent slightly less than 1% of Canadians but make up a disproportionate share. 12.8%, of hospitalized individuals. Twenty-nine percent of all hospital days, or 3.3 million hospital days, were used in hospitalizations that reported a mental diagnosis. More than one-half of these days were from hospitalizations associated with a comorbid mental diagnosis. The average length of stay for those hospitalizations with a mental comorbidity is two times the length of stay without one. This finding was fairly consistent across age, most responsible chapter designation and provinces. Thus, people with mental conditions put a heavy burden on the health care system.

Table 3
Characteristics of hospital days with and without a mental comorbidity diagnosis by major disease types (ICD-10-CA chapter) and age group, Canada excluding Manitoba and Quebec, 2003/2004

		% of hospital days with a mental diagnosis					Mean LOS in hospitalizations with no mental diagnosis					Mean LOS in hospitalizations with a mental diagnosis					Ratio[2]				
	ICD-10-CA chapter	0 to 19	20 to 39	40 to 64	65 or older	Total	0 to 19	20 to 39	40 to 64	65 or older	Total	0 to 19	20 to 39	40 to 64	65 or older	Total	0 to 19	20 to 39	40 to 64	65 or older	Total
	All chapters	4.4	8.0	13.5	18.5	15.1	3.7	3.0	5.4	8.6	5.8	6.8	7.2	11.5	18.1	14.5	1.8	2.4	2.1	2.1	2.5
1	Infectious, parasitic	4.4	22.9	24.7	22.6	20.7	3.1	6.0	8.4	10.5	6.8	11.8	14.3	20.3	18.6	18.1	3.9	2.4	2.4	1.8	2.7
2	Neoplasms	5.9	5.5	7.1	10.8	9.1	9.6	5.4	6.7	10.1	8.3	25.6	18.5	16.7	22.2	20.3	2.7	3.4	2.5	2.2	2.5
3	Blood	3.2	9.9	11.4	13.8	11.5	4.9	4.8	5.5	7.1	6.0	9.5	9.7	10.6	12.5	11.6	1.9	2.0	1.9	1.8	1.9
4	Metabolic	7.6	17.3	20.7	25.5	22.4	4.2	4.5	7.0	9.8	7.5	8.1	8.3	13.2	17.9	15.0	1.9	1.8	1.9	1.8	2.0
6	Nervous	11.7	20.8	27.6	35.0	29.2	4.9	5.7	7.3	9.1	7.3	6.8	10.0	15.2	22.4	17.1	1.4	1.7	2.1	2.5	2.3
7	Eye	1.0	4.1	3.2	11.7	6.5	3.2	1.9	1.8	2.1	2.1	3.2	4.0	3.5	10.8	7.4	1.0	2.2	2.0	5.1	3.5
8	Ear	0.9	6.3	6.6	10.5	7.2	2.0	1.7	2.1	4.0	2.6	1.7	3.8	4.8	7.3	5.8	0.8	2.2	2.2	1.8	2.2
9	Circulatory	9.1	17.7	10.3	15.4	14.2	5.1	4.9	5.9	8.5	7.5	15.9	11.8	11.2	18.3	16.3	3.1	2.4	1.9	2.2	2.2
10	Respiratory	3.0	14.9	20.8	20.8	18.7	2.6	3.6	6.6	9.1	6.3	7.5	7.9	12.2	15.3	13.9	2.9	2.2	1.8	1.7	2.2
11	Digestive	2.8	9.5	12.8	14.0	12.4	3.2	3.8	5.0	6.9	5.3	5.8	7.5	9.8	13.6	11.1	1.8	2.0	2.0	2.0	2.1
12	Skin	3.8	19.3	17.8	20.0	18.1	3.5	5.5	8.6	10.4	7.9	6.7	8.5	15.1	20.6	15.6	1.9	1.5	1.7	2.0	2.0
13	Musculoskeletal	5.4	12.3	8.7	14.0	12.1	4.0	3.2	4.6	7.6	5.8	7.9	12.2	12.2	20.2	16.8	2.0	3.8	2.6	2.7	2.9
14	Genitourinary	1.8	4.5	6.9	18.8	12.5	3.3	2.7	3.4	5.9	4.0	5.5	6.2	10.0	14.3	12.5	1.6	2.3	3.0	2.4	3.1
15	Pregnancy	2.7	1.9	2.4	[1]	2.0	2.6	2.6	2.8	[1]	2.6	3.4	4.8	5.6	[1]	4.7	1.3	1.8	2.0	[1]	1.8
16	Perinatal period	0.2	[1]	[1]	[1]	[1]	9.9	3.6	3.9	[1]	9.9	58.8	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
17	Congenital	4.0	4.8	19.1	14.8	6.0	6.8	5.0	5.3	7.0	6.4	23.5	9.0	29.5	19.8	22.3	3.5	1.8	5.5	2.8	3.5
18	Ill-defined	7.6	16.2	14.4	24.3	20.3	2.6	2.5	3.2	5.6	4.1	4.8	4.7	5.3	13.4	9.6	1.8	1.9	1.7	2.4	2.3
19	Injury/poison	8.1	18.3	19.2	24.9	21.7	2.9	4.0	5.4	10.3	6.5	4.2	5.5	9.3	19.5	12.5	1.4	1.4	1.7	1.9	1.9
20	Supplement	9.6	9.7	16.4	22.3	19.6	3.4	2.5	7.3	13.8	7.9	16.2	14.3	23.4	29.8	26.9	4.8	5.8	3.2	2.2	3.4

[1] Too low to report (less than six hospitalizations with a mental comorbid diagnosis).
[2] The ratio of the average number of days per hospitalization with a mental comorbidity to the average number of days per hospitalization without mental comorbidity.
Notes: This analysis uses only those records that were coded using ICD-10-CA, so 747,510 hospitalizations from Quebec and Manitoba, coded in ICD-9 and ICD 9-CM in 2003/2004, were excluded. Observations with a Most-Responsible mental diagnosis in Canada minus Quebec and Manitoba were excluded (111,986). Thus 1,852,037 or 68.3% of the hospitalizations in 2003/04 are included in this analysis (2,711,533 minus 747,510 minus 111,986). There were also 403 records included in denominator and data not shown corresponding to additional morphology. The number of days ('000) by age group were 745, 1,413, 2,928 and 6,760, for a total of 11,846.
Source: 2003/2004 Hospital Person-Oriented Information.

Table 4
Percentage of hospital days with mental comorbid diagnosis, by ICD-10-CA chapter and type of mental comorbidity, Canada excluding Manitoba and Quebec, 2003/2004

			Type of mental disorder							
	ICD-10-CA chapter	Total number of days ('000s)	Organic	Substance-related	Psychotic	Mood	Anxiety	Personality	Other	Any mental
	All chapters	**11,846**	**7.6**	**2.6**	**0.7**	**3.9**	**1.3**	**0.3**	**1.0**	**15.1**
1	Infectious, parasitic	235	10.3	4.7	0.8	5.1	1.5	0.3	1.6	20.7
2	Neoplasms	1,236	4.1	1.2	0.6	2.5	1.1	0.1	0.6	9.1
3	Blood	117	4.8	2.0	0.5	3.3	0.9	0.2	0.8	11.5
4	Metabolic	396	11.0	3.2	1.1	7.0	1.5	0.5	1.7	22.4
6	Nervous	257	15.4	4.5	1.7	7.4	1.9	0.5	2.5	29.2
7	Eye	15	3.1	1.3	0.7	1.6	0.3	[1]	0.4	6.5
8	Ear	16	1.6	0.5	0.2	2.3	2.4	[1]	0.6	7.2
9	Circulatory	2,217	8.1	1.9	0.5	3.6	1.1	0.1	0.6	14.2
10	Respiratory	1,219	9.3	3.2	1.0	4.2	2.4	0.2	1.1	18.7
11	Digestive	1,187	4.4	3.8	0.5	3.2	1.0	0.3	0.9	12.4
12	Skin	165	6.9	4.9	1.0	4.7	1.3	0.9	1.1	18.1
13	Musculoskeletal	614	5.5	2.0	0.5	3.8	1.2	0.2	0.6	12.1
14	Genitourinary	513	7.9	1.1	0.6	3.0	0.7	0.1	0.5	12.5
15	Pregnancy	699	0.0	0.9	0.1	0.6	0.4	0.1	0.3	2.0
16	Perinatal period	118	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
17	Congenital	63	0.6	1.3	0.2	1.6	0.4	[1]	2.3	6.0
18	Ill-defined	572	9.8	3.0	0.7	5.8	2.4	0.7	1.5	20.3
19	Injury/poison	1,182	11.9	4.5	0.9	4.9	1.2	0.6	1.2	21.7
20	Supplement	1,019	10.9	2.3	0.8	5.6	1.7	0.3	1.5	19.6

[1] Too low to report (less than six hospitalizations with a mental comorbid diagnosis).
Notes: This analysis uses only those records that were coded using ICD-10-CA, so the 747,510 hospitalizations from Quebec and Manitoba, coded in ICD 9 and ICD 9-CM in 2003/2004, were excluded. Observations with a Most-Responsible mental diagnosis in Canada minus Quebec and Manitoba were excluded (111,986). Thus 1,852,037 or 68.3% of the hospitalizations in 2003/04 are included in this analysis (2,711,533 minus 747,510 minus 111,986). There were also 403 records included in denominator and data not shown corresponding to additional morphology. The "Any mental comobidity' percentage is lower than the sum of the seven categories as some hospitalizations reported more than one mental condition.
Source: 2003/2004 Hospital Person-Oriented Information.

Part 2: Characteristics of individuals hospitalized with a diagnosis of a mental condition

Results presented thus far clearly highlight the heavy burden of mental conditions on acute-care hospitalizations, whether as most responsible or comorbid diagnoses. Hence, it is important to understand this patient population and the factors that may be contributing to the additional burden on hospital services. Evidence to date suggests that various risk factors are often more prevalent among individuals with mental conditions. Compared with those without a mental condition, individuals with a current mental condition are generally less likely to be married,[26,40,41] more likely to have low income or be unemployed,[28,29,40,41] more likely to be smokers,[12,29,42,43,44,45,46] and, in some cases, more likely to be overweight or obese.[43,44,47,48,49,50] Individuals with mental conditions have also been found to have higher prevalence of several chronic physical conditions, in particular, chronic pain, diabetes, cardiovascular disease, high blood pressure and respiratory conditions.[12,13,14] These factors are also often associated with increased use of hospital services, and so they may be associated with the increased use of services among this patient population.

In this second section, we used linked survey and hospital data to identify those factors associated with future hospitalizations with a diagnosis of a mental condition. The Canadian Community Health Survey (CCHS) was linked to the hospital administrative data. (See Data source text box for more details.) The linked survey and hospital admission data provided a unique opportunity to consider a comprehensive set of characteristics that may be associated with hospitalizations with a mental diagnosis. Selected demographic, socioeconomic, health status, health behaviour and health care experience characteristics were identified for survey respondents who did and did not experience a hospitalization related to mental health within the next four years. Tables 5 to 8 summarize all the variables examined.

Findings

Individuals hospitalized at least once with a diagnosis of a mental condition tended to be in lower socioeconomic groups compared with those hospitalized with other conditions

Lower educational attainment was more common among people hospitalized with a diagnosis of a mental condition than those without this condition. Considering hospitalizations over the four years after the CCHS was administered, 42.8% of those admitted with a comorbid diagnosis of a mental condition had a secondary education or less as their highest educational attainment (Table 5). This compared with 29.2% of those admitted without a diagnosis of a mental condition.

Data source

Canadian Community Health Survey

The Canadian Community Health Survey (CCHS) continuously gathers cross-sectional information about the health and health care use of Canadians. The survey covers the non-institutionalized household population aged 12 or older in all provinces and territories, except members of the regular Canadian Forces as well as residents of Indian reserves, of Canadian Forces bases (military and civilian) and of some remote areas. The methodology has been previously described.[51] The overall response rate to the 2000/2001 CCHS was 85%; the total sample numbered 131,535.

Linking health survey and hospital data

Data from the CCHS (Cycle 1.1) were linked at the individual level to the Hospital Morbidity Database (HMDB) (2000/2001 to 2004/2005) using probabilistic linkage methodology. Unique identifying information including personal health number, postal code, date of birth and age were used in the linkage process. Insufficient information was available in the hospital data for Quebec residents' records to be linked; therefore, the 22,667 (17.2%) CCHS respondents in Quebec were dropped. Of the 108,868 respondents who remained, 90,450 had given permission for their survey data to be linked to administrative data. Check-digit algorithms were used to verify the plausibility of the health numbers they provided; 72,363 respondents provided a plausible health number required for data linkage and were used in this analysis. Thus, linkage was conducted only for CCHS survey respondents living outside Quebec who provided consent to link their survey information to other sources of health information and a usable personal health number. The linkage was conducted by Statistics Canada. Additional information regarding the linkage process is provided elsewhere.[30] A recently published evaluation of the linkage between the CCHS and HPOI reported high coverage for the population younger than age 75.[52]

Table 5
Selected socio-economic and demographic characteristics in 2000/2001, by hospital admission status within four years of follow-up, household population aged 12 plus, Canada excluding territories and Quebec

Socio-economic and demographic characteristics	At least one hospitalization with a most-responsible mental diagnosis (n=227,000)				At least one hospitalization with a comorbid mental diagnosis (n=282,000)				Hospitalization without any reported mental diagnoses (n=2,616,000)				No hospitalization (n=16,253,000)			
		Age-sex standardized weighted estimate				Age-sex standardized weighted estimate				Age-sex standardized weighted estimate				Age-sex standardized weighted estimate		
	Weighted Number ('000s)	%	95% confidence interval from	to	Weighted Number ('000s)	%	95% confidence interval from	to	Weighted Number ('000s)	%	95% confidence interval from	to	Weighted Number ('000s)	%	95% confidence interval from	to
Household income quintile																
Lowest	16	8.7*	6.3	11.1	14	7.0[E]	3.8	10.2	83	3.7	3.1	4.2	431	3.0	2.7	3.2
Lowest middle	35	17.4*	13.2	21.6	32	12.8	9.0	16.6	223	8.5	7.4	9.7	922	6.4*	6.1	6.8
Middle	58	28.2	22.5	33.9	82	28.7	22.7	34.7	593	21.8	20.4	23.2	2,915	20.6	20.0	21.2
Upper middle	59	29.2	24.2	34.2	73	27.6*	22.1	33.1	788	35.8	34.1	37.5	5,098	35.0	34.3	35.8
Highest	31	16.5*	11.3	21.7	43	24.0[E]	16.1	31.8	594	30.1	28.3	31.9	5,180	34.9*	34.1	35.7
Education																
Secondary graduation or less	93	40.0*	34.6	45.3	130	42.8*	36.0	49.6	870	29.2	27.7	30.7	4,191	26.6*	26.1	27.1
Some postsecondary	60	27.2	21.9	32.5	59	25.6	18.8	32.3	703	28.9	27.2	30.5	4,687	28.8	28.1	29.4
Postsecondary graduation	71	32.8*	28.2	37.5	88	31.6*	25.4	37.9	1,022	41.9	40.0	43.7	7,257	44.6*	44.0	45.3
Marital status																
Married/Common-law	97	43.2*	38.5	48.0	143	47.3*	40.4	54.1	1,674	61.8	60.0	63.6	9,398	58.9*	58.3	59.5
Widowed	20	6.2	4.9	7.6	67	8.2*	6.7	9.7	336	5.8	5.4	6.1	521	4.2*	4.0	4.5
Separated/Divorced	25	11.9*	9.3	14.4	32	14.2*	9.9	18.4	208	7.8	7.0	8.7	1,050	6.6*	6.3	6.8
Single, never married	85	38.7*	34.5	42.8	40	30.4	24.1	36.7	397	24.6	22.9	26.3	5,274	30.3*	29.9	30.8
Immigrant status																
Immigrant	38	16.1	11.8	20.3	57	19.9[E]	12.3	27.5	547	16.9	15.2	18.6	3,822	24.1*	23.4	24.8
Non-Immigrant	189	83.9	79.7	88.2	225	80.1	72.5	87.7	2,067	83.1	81.4	84.8	12,428	75.9*	75.2	76.6
Race																
White	202	89.0	85.4	92.5	262	85.3	78.1	92.5	2,394	89.9	88.2	91.6	13,411	83.1*	82.4	83.8
Non-white	16	7.4[E]	4.2	10.7	14	F	!	!	189	8.6	6.9	10.3	2,629	15.8*	15.0	16.5
Aboriginal	8	3.6*[E]	2.2	5.0	6	4.4*[E]	2.3	6.4	29	1.5	1.1	1.8	193	1.1	1.0	1.2
Rural																
Yes	39	16.5*	13.2	19.8	45	15.9*	12.2	19.7	555	21.6	20.2	23.0	2,937	18.1*	17.4	18.8
No	188	83.5*	80.2	86.8	237	84.1*	80.3	87.8	2,062	78.4	77.0	79.8	13,316	81.9*	81.2	82.6

! Too low to report (less than six hospitalizations with a mental comorbid diagnosis).
* significantly different than the percentage within the hospitalized group without any reported mental diagnosis
[E] use with caution
F too unreliable to be published
Source: 2000/2001 Canadian Community Health Survey; linked by person to the 2000/2001 to 2004/2005 Hospital Person-Oriented Information.

There was a similar story for income. Lower incomes were more common among people hospitalized with a diagnosis of a mental condition than was the case for those without this condition. Approximately 8.7% of those hospitalized with a most responsible diagnosis of a mental condition, and 7.0% with a comorbid diagnosis were in the lowest income quintile compared with 3.7% in the comparison group (Table 5).

Individuals who experienced a hospitalization with a diagnosis of a mental condition were less likely to be married or common-law (43.2% MR, 47.3% comorbid) compared with the comparison group (61.8%).

Hospitalizations with a most responsible diagnosis of a mental condition and with a comorbid diagnosis featured a higher percentage of Aboriginal people (3.6% and 4.4%) than hospitalizations without a diagnosis of a mental condition (1.5%) (Table 5). People that lived in a rural area were less likely to have a diagnosis of a mental condition in a hospitalization compared with those from urban areas. Immigrant status showed no effect.

Lifestyle factors such as smoking were associated with hospitalizations with a mental diagnosis

A higher percentage of individuals hospitalized with a diagnosis of a mental condition reported being a current smoker than those hospitalized without a diagnosis of a mental condition. Approximately one-half of those who were

Table 6
Selected health behaviours and risk factor characteristics in 2000/2001, by hospital admission status within four years of follow-up, household population aged 12 plus, Canada excluding territories and Quebec

	At least one hospitalization with a most-responsible mental diagnosis (n=227,000)				At least one hospitalization with a comorbid mental diagnosis (n=282,000)				Hospitalization without any reported mental diagnoses (n=2,616,000)				No hospitalization (n=16,253,000)			
		Age-sex standardized weighted estimate				Age-sex standardized weighted estimate				Age-sex standardized weighted estimate				Age-sex standardized weighted estimate		
			95% confidence interval				95% confidence interval				95% confidence interval				95% confidence interval	
Health behaviours and risk factors	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to
Smoking																
Never	51	21.3*	17.1	25.5	65	21.8*	16.9	26.8	786	30.8	29.0	32.5	6,348	38.7*	38.0	39.3
Former	65	27.0*	22.8	31.3	123	30.2*	22.9	37.5	1,221	40.8	39.0	42.6	5,892	37.5*	36.9	38.1
Current	110	51.7*	46.3	57.1	92	48.0*	41.7	54.3	607	28.4	26.7	30.1	3,988	23.8*	23.2	24.4
Alcohol																
Regular drinker	102	46.5*	41.3	51.6	125	55.2	48.8	61.7	1,303	54.0	52.2	55.7	9,323	57.1*	56.4	57.8
Occasional drinker	49	22.4	17.6	27.2	57	19.6	15.0	24.2	586	22.8	21.4	24.3	3,203	19.8*	19.3	20.3
Not a drinker	75	31.2*	25.5	36.8	100	25.2	20.5	29.8	724	23.2	21.9	24.6	3,691	23.1	22.5	23.7
Body mass index																
Underweight	24	10.4	7.3	13.4	35	13.3	9.0	17.6	214	9.9	8.6	11.3	1,966	11.9*	11.5	12.3
Normal	100	44.1	38.2	50.0	106	40.3	32.9	47.6	978	39.3	37.4	41.1	6,861	43.1*	42.5	43.8
Overweight	67	30.4	25.4	35.5	86	28.1	22.7	33.6	854	30.9	29.3	32.6	4,833	31.1	30.5	31.7
Obese	32	15.1[†]	10.4	19.7	47	18.3	13.2	23.4	504	19.9	18.4	21.3	2,183	13.9*	13.4	14.4
Vegetable and fruit consumption																
Five or more servings per day	150	68.5	63.2	73.9	172	65.6	59.6	71.6	1,627	66.5	65.0	68.1	10,327	63.6*	62.9	64.3
Fewer than five servings per day	71	31.5	26.1	36.8	105	34.4	28.4	40.4	962	33.5	31.9	35.0	5,770	36.4*	35.7	37.1
Sense of community belonging																
Weak	97	48.5*	42.9	54.1	100	45.7	38.1	53.4	866	37.2	35.3	39.1	6,032	38.7	38.0	39.4
Not Weak	106	51.5*	45.9	57.1	142	54.3	46.6	61.9	1,596	62.8	60.9	64.7	9,337	61.3	60.6	62.0

* significantly different than the percentage within the hospitalized group without any reported mental diagnosis
[†] use with caution
Source: 2000/2001 Canadian Community Health Survey; linked by person to the 2000/2001 to 2004/2005 Hospital Person-Oriented Information.

admitted to the hospital with either a most responsible or comorbid diagnosis of a mental condition reported being current smokers compared with only 28.4% who entered the hospital without a diagnosis of a mental condition (Table 6).

A higher percentage of those hospitalized with a most responsible diagnosis of a mental condition were non-drinkers (31.2%) compared with those who went to the hospital for other causes (23.2%) (Table 6).

Forty-eight point five percent (48.5%) of those hospitalized with a most responsible diagnosis of a mental condition had a weak sense of community belonging compared with those who went to the hospital for other causes (37.2%) (Table 6).

Body mass distribution appears to be similar across the different hospitalization groups (Table 6).

Individuals who experienced at least one hospitalization with a diagnosis of a mental condition tend to report lower health status compared with those hospitalized with other conditions

Individuals who were hospitalized with a most responsible or comorbid diagnosis of a mental condition reported poorer health status across several measures, including self-reported fair/poor health and disability (as obtained from the Health Utility Index), compared with those hospitalized with no mental conditions (Table 7).

Individuals who hospitalized with a comorbid mental diagnosis were more likely to have three or more chronic conditions compared with those hospitalized with no diagnosis of a mental condition (21.3% vs. 11.8%) (Table 7). The percentages for those with particular diseases—diabetes, arthritis, chronic obstructive pulmonary disease (COPD), asthma, heart disease, and stroke—were also higher among

Table 7
Selected health status characteristics in 2000/2001, by hospital admission status within four years of follow-up, household population aged 12 plus, Canada excluding territories and Quebec

	At least one hospitalization with a most-responsible mental diagnosis (n=227,000)				At least one hospitalization with a comorbid mental diagnosis (n=282,000)				Hospitalization without any reported mental diagnoses (n=2,616,000)				No hospitalization (n=16,253,000)			
		Age-sex standardized weighted estimate				Age-sex standardized weighted estimate				Age-sex standardized weighted estimate				Age-sex standardized weighted estimate		
			95% confidence interval				95% confidence interval				95% confidence interval				95% confidence interval	
Health status characteristics	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to
Self-reported health																
Excellent/Very good	71	31.6*	26.8	36.5	59	25.6*	19.6	31.5	1,092	49.5	47.6	51.3	10,710	64.7*	64.1	65.3
Good	67	29.9	24.9	35.0	85	32.2	25.7	38.6	819	30.2	28.4	32.0	4,082	25.6*	25.0	26.1
Fair/poor	88	38.4*	32.6	44.2	138	42.3*	36.4	48.1	705	20.3	19.1	21.5	1,458	9.7*	9.3	10.2
Health Utilities Index[§]																
Severe disability	9	4.7*[E]	1.9	7.6	19	6.4*[E]	3.7	9.1	38	1.4	1.0	1.8	54	0.5*	0.4	0.7
Moderate-Severe disability	48	25.1*	19.1	31.1	65	23.5*	18.2	28.7	287	11.9	10.9	12.9	668	5.9*	5.5	6.3
Moderate disability	25	13.7*	9.6	17.7	32	12.8*[E]	8.0	17.6	185	6.7	5.8	7.6	514	4.6*	4.2	4.9
Mild disability	39	19.1	15.2	22.9	57	24.8	18.6	31.1	495	22.2	20.7	23.6	2,280	19.9*	19.3	20.6
Mild -No disability	47	23.6	18.6	28.6	40	18.2*	13.4	23.0	569	29.9	28.0	31.9	4,067	34.1*	33.4	34.8
No disability	26	13.9*	10.2	17.5	36	14.2*	10.8	17.7	609	27.9	26.1	29.6	3,992	34.9*	34.1	35.7
Number of selected comorbidities[†]																
None	91	41.3	36.0	46.5	51	30.1*	23.8	36.4	885	45.9	44.2	47.7	10,503	62.3*	61.7	63.0
One	64	29.2	23.8	34.5	80	30.2	23.0	37.3	716	27.5	25.9	29.1	3,650	23.0*	22.5	23.6
Two	37	16.0	12.8	19.2	60	18.5	13.8	23.1	500	14.8	13.7	15.9	1,392	9.5*	9.1	9.9
Three or more	35	13.6	10.7	16.4	91	21.3*	17.3	25.3	514	11.8	11.0	12.5	709	5.2*	4.9	5.5
Depressed																
Yes	65	33.9*	27.9	39.8	32	19.9*	14.5	25.4	203	10.2	9.1	11.3	1,253	7.8*	7.4	8.2
No	143	66.1*	60.2	72.1	229	80.1*	74.6	85.5	2,290	89.8	88.7	90.9	14,324	92.2*	91.8	92.6
Took antidepressants																
Yes	36	17.1*	12.7	21.5	17	7.7*[E]	3.2	12.1	70	2.7	2.2	3.2	304	1.9*	1.7	2.1
No	190	82.9*	78.5	87.3	265	92.3*	87.9	96.8	2,545	97.3	96.8	97.8	15,946	98.1*	97.9	98.3
Self-reported daily stress																
None	56	24.9	20.3	29.4	110	26.2	20.1	32.4	987	31.8	30.0	33.6	4,716	34.1	33.5	34.8
Some	64	31.4	25.8	37.0	89	41.0	34.1	47.8	921	41.0	39.2	42.8	6,261	42.2	41.5	42.9
High	83	43.7*	37.4	50.1	76	32.8	26.6	39.0	601	27.3	25.6	28.9	3,519	23.6*	23.0	24.3
Diabetes																
Yes	15	6.8[E]	4.3	9.3	44	11.5*	8.5	14.6	277	7.1	6.4	7.8	483	3.4*	3.2	3.7
No	211	93.2	90.7	95.7	238	88.5*	85.4	91.5	2,338	92.9	92.2	93.6	15,764	96.6*	96.3	96.8
Arthritis																
Yes	53	21.3	17.9	24.7	123	30.6*	26.0	35.1	861	22.2	21.1	23.2	2,219	15.4*	14.9	15.9
No	174	78.7	75.3	82.1	159	69.4*	64.9	74.0	1,753	77.8	76.8	78.9	14,018	84.6*	84.1	85.1
COPD																
Yes	7	2.6[E]	1.0	4.2	19	3.9*[E]	2.4	5.4	72	1.4	1.2	1.6	77	0.6*	0.5	0.7
No	220	97.4	95.8	99.0	262	96.1*	94.6	97.6	2,542	98.6	98.4	98.8	16,173	99.4*	99.3	99.5
Asthma																
Yes	32	14.2	10.6	17.7	43	22.2*[E]	14.6	29.8	274	11.4	10.2	12.6	1,312	7.9*	7.6	8.2
No	195	85.8	82.3	89.4	239	77.8*	70.2	85.4	2,341	88.6	87.4	89.8	14,934	92.1*	91.8	92.4
Heart Disease																
Yes	21	7.3	5.5	9.2	70	13.2*	9.7	16.8	402	8.7	8.0	9.4	489	3.7*	3.4	4.0
No	206	92.7	90.8	94.5	211	86.8*	83.2	90.3	2,211	91.3	90.6	92.0	15,759	96.3*	96.0	96.6
High Blood Pressure																
Yes	41	16.4	13.2	19.6	91	21.1	16.4	25.8	686	17.1	16.1	18.2	1,664	11.9*	11.4	12.3
No	186	83.6	80.4	86.8	191	78.9	74.2	83.6	1,928	82.9	81.8	83.9	14,569	88.1*	87.7	88.6
Stroke																
Yes	7	2.6[E]	1.6	3.5	26	4.4*[E]	2.8	6.1	85	1.7	1.4	2.0	92	0.7*	0.6	0.9
No	219	97.4	96.5	98.4	256	95.6*	93.9	97.2	2,530	98.3	98.0	98.6	16,159	99.3*	99.1	99.4
Cancer																
Yes	6	F	-	-	18	3.7[E]	2.1	5.3	143	3.6	3.1	4.1	205	1.5*	1.3	1.7
No	221	97.4	95.5	99.4	264	96.3	94.7	97.9	2,471	96.4	95.9	96.9	16,044	98.5*	98.3	98.7
Pain																
Yes	82	36.5*	30.9	42.0	102	35.6*	30.1	41.1	766	25.6	24.3	26.9	2,288	14.6*	14.1	15.1
No	144	63.5*	58.0	69.1	180	64.4*	58.9	69.9	1,847	74.4	73.1	75.7	13,956	85.4*	84.9	85.9

* Significantly different than the percentage within the hospitalized group without any reported mental diagnosis.
† Arthritis, chronic obstructive pulmonary disease, heart disease, cancer, high blood pressure, diabetes.
§ Health Utilities Index which provides a description of an individual's overall functional health, based on eight attributes: vision, hearing, speech, ambulation (ability to get around), dexterity (use of hands and fingers), emotion (feelings), cognition (memory and thinking) and pain. It ranges from 1.00 (normal) to 0.00 (most disabled).
E use with caution
F too unreliable to be published
Source: 2000/2001 Canadian Community Health Survey; linked by person to the 2000/2001 to 2004/2005 Hospital Person-Oriented Information.

Table 8
Selected health care use characteristics in 2000/2001, by hospital admission status within four years of follow-up, household population aged 12 plus, Canada excluding territories and Quebec

	At least one hospitalization with a most-responsible mental diagnosis (n=227,000)				At least one hospitalization with a comorbid mental diagnosis (n=282,000)				Hospitalization without any reported mental diagnoses (n=2,616,000)				No hospitalization (n=16,253,000)			
		Age-sex standardized weighted estimate				Age-sex standardized weighted estimate				Age-sex standardized weighted estimate				Age-sex standardized weighted estimate		
			95% confidence interval				95% confidence interval				95% confidence interval				95% confidence interval	
Health care use	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to	Weighted Number ('000s)	%	from	to
Have regular medical doctor																
Yes	206	90.5	87.3	93.7	260	87.4	82.0	92.9	2,456	91.7	90.7	92.7	14,147	87.7*	87.3	88.1
No	20	9.5[t]	6.3	12.7	22	12.6[t]	7.1	18.0	160	8.3	7.3	9.3	2,098	12.3*	11.9	12.7
Mental Health Professional																
Yes	94	44.7*	39.2	50.3	37	21.9*	16.1	27.7	212	10.1	9.1	11.1	1,349	8.1*	7.7	8.5
No	131	55.3*	49.7	60.8	243	78.1*	72.3	83.9	2,394	89.9	88.9	90.9	14,858	91.9*	91.5	92.3
Reported unmet health care needs																
Yes	54	25.9*	21.3	30.4	48	23.1	17.8	28.3	382	16.5	15.1	17.8	1,993	12.0*	11.5	12.4
No	172	74.1*	69.6	78.7	234	76.9	71.7	82.2	2,232	83.5	82.2	84.9	14,252	88.0*	87.6	88.5
Reported unmet mental health care needs																
Yes	22	10.7*	7.6	13.9	5	3.2[t]	1.2	5.2	26	1.3	0.9	1.8	159	0.9	0.8	1.1
No	204	89.3*	86.1	92.4	278	96.8	94.8	98.8	2,588	98.7	98.2	99.1	16,086	99.1	98.9	99.2
Type of health professionals providing care																
No health professional	15	8.4[t]	3.8	12.9	15	6.5*[t]	2.8	10.2	210	10.9	9.8	12.1	2,722	16.8*	16.4	17.3
Only doctors	86	44.3*	38.7	49.9	156	52.9*	45.8	59.9	1,659	63.9	62.0	65.7	10,025	64.5	63.8	65.1
Doctors plus other health professionals	82	45.9*	39.5	52.3	85	40.1*	32.7	47.5	593	24.3	22.7	26.0	2,780	17.6*	17.0	18.1
No doctors, only other health professionals	2	1.4[t]	0.6	2.3	1	F	...	...	17	0.9	0.5	1.2	187	1.1	1.0	1.3

* significantly different than the percentage within the hospitalized group without any reported mental diagnosis
[t] use with caution
F too unreliable to be published
Source: 2000/2001 Canadian Community Health Survey; linked by person to the 2000/2001 to 2004/2005 Hospital Person-Oriented Information.

those hospitalized with a comorbid diagnosis of a mental condition (Table 7). Those with a hospitalization related to a mental condition were also more likely to report pain (36.5% most responsible; 35.6% comorbid), compared with those who hospitalized for other types of experienced other types of hospitalizations (25.6%) (Table 7).

As would be expected, individuals who experienced a hospitalization related to a mental condition were also more likely to report being depressed, taking antidepressants or being under "high" stress at the time of the survey when compared with those who experienced a hospitalization with no diagnosed mental condition.

Individuals experiencing a hospitalization with a mental diagnosis were more likely to report unmet health care needs

Individuals hospitalized with a diagnosis of a mental condition were more likely to have seen a mental health professional compared with those with a non-mental hospitalization (44.7% most responsible mental and 21.9% comorbid mental compared with 10.1% non-mental) (Table 8). This was not unexpected. However, similar percentages of individuals hospitalized with a diagnosis of a mental condition had a regular medical doctor as those with those hospitalized without a diagnosis of a mental condition (90.5% most responsible and 87.4% comorbid compared with 91.7% without diagnosis of mental condition) (Table 8).

Individuals hospitalized with a diagnosis of a mental condition were more likely to report unmet health care needs. A higher percentage of individuals hospitalized with a mental condition reported unmet health care needs compared with those hospitalized without a mental condition (25.9% most responsible; 23.1% comorbid and 16.5% without diagnosis of mental condition) (Table 8). The percentages who reported unmet mental health care needs were also higher for those hospitalized with a most responsible diagnosis of a mental condition (10.7% most responsible vs. 1.3% without diagnosis of mental condition). These differences in unmet health care needs translate into a significantly higher likelihood of a hospitalization with a diagnosis of a mental condition.

Methods

Using the linked data, we compare the characteristics of individuals in the following four groups: individuals who within the next four years had

1. at least one hospitalization with a most responsible mental diagnosis
2. at least one hospitalization with a comorbid mental diagnosis (and no hospitalizations with a most responsible mental diagnosis)
3. hospitalization without any mental diagnoses
4. no hospitalization.

Variables were derived from the Canadian Community Health Survey (CCHS) survey data and grouped in the following categories: demographic (age, sex, rural/urban status, race), socioeconomic status (household income, education level, family/marital status, immigration status), health status (self-reported health, disability level, presence of comorbidity, self-reported daily stress, impact of health problems, pain), health behaviours / risk factors (smoking status, body mass index), and access to health care services (access to regular medical doctor, unmet healthcare needs).

Descriptive analysis conducted include weighted prevalence of various demographic, socioeconomic, health status and health care use indicators, which were calculated using SAS software (version 9.1). Individuals who were admitted to hospital with conditions not related to mental health were the reference group. Given the difference in age structure, the rates have been age/sex standardized.

The bootstrap technique was applied to all analyses to account for the complex survey design and to estimate the variance and confidence intervals. Survey weights were specifically produced by Statistics Canada for the linked file to adjust for non-response to the CCHS, as well as for the exclusion of records of respondents who did not provide plausible health numbers or give permission for linkage to administrative health data. These weights were applied to the analysis file. The weighted data were representative of the Canadian household population residing outside Quebec.

Summary

These results reflect the prevalence of risk factors reported in the literature, such as lower socioeconomic status, single marital status, smoking, and higher prevalence of chronic physical conditions, among people with chronic mental conditions. The aim of this study, however, is to identify factors that are associated with future hospitalization with a diagnosis of a mental condition. In summary, based on the age/sex adjusted results (Tables 5 to 8), individuals who had a high school education or less, were in the lower household income quintiles, were not married, were Aboriginal, were current smokers, reported being depressed or using antidepressants, reported fair/poor health, had physical diseases such as diabetes, arthritis, COPD, heart disease, asthma, previous stroke or pain, and who reported unmet health care needs were more likely to be admitted to hospital within the next four years with a mental health condition compared with those who were admitted to hospital within the next four years without a mental health condition.

As most of these factors could also contribute to the higher use of hospital resources, future work is needed to study how these factors are associated with longer average length of hospital stay among those with a diagnosed mental condition.

Discussion and conclusions

People with mental conditions place a high burden on the health care system. While those who are hospitalized for reasons related to mental health—with either a most responsible or comorbid diagnosis—make up a small proportion of the overall population (1%), they consume a significantly larger proportion of hospital services. Twenty-nine percent of all hospital days, or 5.8 million hospital days, were used in hospitalizations that recorded a mental condition. More than one-half of these days were from hospitalizations associated with a comorbid mental diagnosis. Most previous reports regarding hospitalizations focus on mental conditions as a most responsible diagnosis and provide only limited information regarding the burden of mental conditions as comorbidity.[21,22,23] Thus, very little information has been previously available across Canada on mental conditions as a comorbid condition. Our report emphasizes comorbid mental conditions.

The average length of stay for those hospitalizations with a mental comorbidity is two times the length of stay for hospitalizations without one. This finding was fairly consistent across age, most responsible chapter designation and provinces. Some early U.S. studies used retrospective record review and prospective diagnosis to compare the average

Limitations

Limitations of the hospital file

Like other work using administrative hospital data, this work has several general limitations. These data come from provincial reports, and linkages were conducted within each provincial dataset, so identifying patients who used hospital resources in more than one province is impossible. This could overestimate the number of patients and underestimate the total length of stay for some patients, and may be a significant factor for smaller provinces or areas near provincial borders. Deaths outside of hospital were not included, so the analysis dataset underestimates the number of patients who died subsequent to hospitalization. The validity of conclusions drawn from analyses of large administrative databases depends on the accuracy of case-defining diagnostic codes. Hospital administrative data do not include hospitalizations to psychiatric hospitals, so some of the most severe mental conditions are missing from analysis. Hospitalizations from psychiatric hospitals represent less than 15% of all mental related hospitalizations;[22,23] nevertheless, their exclusion is unfortunate. The analyses presented here are limited to acute-care hospitalizations. Ideally, we would be able to consider the use of emergency rooms and hospitalizations to physicians and other providers as well.

Limitations of the linked survey-hospital file

The analyses here exclude respondents from Quebec, because that province provided Statistics Canada with scrambled health numbers, as well as postal codes with insufficient details, making it impossible to link administrative records and survey responses.

The linkage of CCHS and hospital data, while probabilistic, does not include names. This means that there is a strong dependence on health insurance number, and little likelihood of successfully linking records where the health insurance number is missing or incorrectly coded.

Censoring before the end of the four-year period because of events such as death or moving out of the province could not be accounted for, because information about these events was not available or incomplete.

length of stay of patients with diagnosed or suspected mental comorbidity to comparison groups. These studies also found longer hospitalizations for those with a mental condition.[53,54,55,56] Results of these retrospective analyses led to prospective studies that identified patients with psychiatric conditions during hospitalization, and that also found longer lengths of stay with mental comorbidity.[57,58,59,60] The majority of these studies failed to adequately control for other variables affecting length of stay and, in addition, these studies were largely carried out within only one or two sites. The analysis by Bressi (2006)[61] addresses these concerns by using a nationally (United States) representative sample of hospitalizations and controlling for patient and hospital characteristics. Their analyses showed that the existence of a psychiatric comorbidity predicted longer hospitalizations for medical inpatients.

The results of this study indicate that a mental diagnosis is a common comorbidity for many physical conditions. This agrees with current evidence that suggests significant comorbidity between chronic physical conditions and mental conditions.[11] Several studies have illustrated poorer physical health status and higher prevalence of chronic physical conditions, disease, and chronic disease risk factors among people with mental conditions.[12,13,14,48,49,50,62] Research has frequently also found that the prevalence of mental conditions is higher in people with chronic physical disorders than in people without physical disorders.[63,64,65,66] Thus, contemporary epidemiological data shows the frequent co-occurrence of certain physical diseases and certain mental conditions. In particular, cardiovascular disease, hypertension, respiratory disorders, diabetes mellitus, and other metabolic disorders have been found alongside mental conditions.[67]

This combination of mental and physical conditions leads to two streams in the literature. First, from the patient side, it seems that patients with a serious mental condition are less aware of co-occurring medical conditions. For example, patients from the Department of Veterans Affairs (VA) National Psychosis Registry with a serious mental condition were less likely than those without a serious mental condition to self-report having a medical condition (such as heart disease, arthritis, cancer, diabetes, back pain, congestive heart failure, or hypertension) that was recorded in their medical record.[68] Patients with mental comorbidity also introduce another level of complexity of care. Mental comorbidity complicates help-seeking, diagnosis, and treatment, and influences prognosis.[4]

Second, from the health care side, it has been reported that health services are not provided equitably to people with mental conditions, and that the quality of care for both mental and physical health conditions for these people could

be improved.[4,69,70,71] Traditional reactive consultation services are likely to see only a small percentage of the general-hospital patients who could benefit from their care.[72] These patients can easily fall into the crack in between different levels of disjointed health services.[18] In this report, we found that those with a mental condition are more likely to report unmet health care needs compared with those who were hospitalized for a non-mental health diagnosis. In one example from the literature, Frayne SM et al. (2005) found that failure to meet diabetes performance measures was more common in patients with mental conditions, and that the percentage not meeting diabetes care standards increased with a greater number of mental conditions.[73]

On a more positive note, Krein S.L. et al. (2006),[74] using data from the Department of Veterans Affairs (VA) health care system, found that quality-of-care measures and intermediate outcomes were comparable for diabetes patients with and without serious mental conditions. This paper suggests that care is similar "possibly because of increased levels of contact with the health system and the VA's integration of medical and mental health services."

Several other papers have suggested that it would be advantageous to integrate physical and mental health care. Kathol et al. (2008)[75] describes the potential advantages if assessment and treatment of mental and substance use conditions became a clinical, administrative, and financial part of physical health care with common provider networks, the ability to combine service locations (integrated clinics and inpatient units), similar coding and billing procedures, and a single funding pool. Others have said that mental health awareness needs to be integrated into all aspects of health and social policy, health-system planning, and delivery of primary and secondary general health care.[4,76,77] The challenge is creating a system in which people with coexisting mental health and/or substance abuse problems as well as physical disorders find 'no wrong door' when they seek help.[78] A recent Standing Senate Committee Report[18] reported that patients with mental conditions confront a confusing, fragmented, under-resourced system and that a more coordinated system would be of use.

As an example of the benefits of an integrated physical and mental health care system, there would be more awareness that many medications prescribed for serious mental conditions have significant metabolic and cardiovascular adverse effects.[79] For example, Kiraly et al (2008)[79] suggest that patients treated with second-generation antipsychotics should receive preventive counselling and treatment for cardiovascular disease. Drug interactions can also lead to increased adverse effects, increased or decreased drug levels, toxicity, or treatment failure. Patients might also 'self-medicate' using licit or illicit drugs.[80] If patient care is co-ordinated between primary care physicians and mental health professionals, there is likely less chance of serious adverse effects.

As well as the integration of physical and mental care, other systematic approaches have been suggested in the literature, including up-stream prevention strategies[81,82] and support programs to help such individuals stay in the community.[83] Thus, hospitalization is only one of a number of approaches to mental health care in Canada today.[20] With advances in psychiatric medications, the development of a spectrum of community-based services, and the high costs associated with institutionalization, some mental health care has been moved to outside the hospital setting. Other reports caution, however, that community care may not necessarily reduce the need for hospital care.[82,84,85,86,87,88,89]

We found variations across provinces and health regions in the percentage of hospitalizations and hospital days and in the mean lengths of stay of hospitalizations with a mental diagnosis. The variations across health regions are associated with many factors, such as the number and type of facilities, which may vary from region to region. They could reflect potential differences in the prevalence of mental conditions within the population, in physicians' professional diagnostic and practice styles, in acute-care-hospital treatment practices or in differences in coding practices, specifically as related to comorbidity. Regarding the last point, the average number of documented diagnoses per hospitalization varies greatly from province to province: Quebec reported the highest average number of comorbid diagnoses per hospitalization; Newfoundland and Labrador and Prince Edward Island reported the lowest number.[39]

From the hospital data, we found that those with a mental condition are more likely to have many common types of comorbidity. They are more vulnerable in other ways, too. Using the linked survey-hospital database, we found that they were more likely to have had a weak sense of community belonging, more likely to be single rather than married, have less than high school education, are less likely to be in an upper income quintile and are more likely to have reported fair/poor health, have pain, and report disability and unmet health care needs compared with those who experienced hospitalization not related to mental health.

This reinforces and adds to the evidence reported to date that, compared with those without a mental condition, individuals with a current mental condition are generally less likely to be married,[26,40,41] more likely to have low income or be unemployed,[28,29,40,41] and more likely to be smokers.[12,29,42,43,44,45,46] In some recent reports, administrative data have been supplemented with data from other sources for a more comprehensive picture of individuals with mental illness. For example, a recent report produced jointly by Statistics Canada and the Canadian Institute for Health Information (CIHI) uses

linked survey and administrative data to identify the patient characteristics associated with hospitalization among those with depression.[26] A recent Ontario-based report from CIHI uses the new Ontario Mental Health Reporting System to report on both the hospitalizations for mental illness as well as key characteristics of mental health patients including patient characteristics.[29] The results revealed that those admitted to a mental health bed had lower rates of labour force participation, lower rates of being married or living with a partner, and lower levels of education compared with the overall Ontario population 15 and older. A report from Manitoba provided an overview of the prevalence of mental conditions. It compared five neighbourhood income groupings (called 'income quintiles') based on the average household income of the area, and reported that highest rates of mental illness were in the lowest income neighbourhoods.[28]

A key point from our study is that those with a mental condition are more likely to report unmet health care needs compared with those who experienced a non-mental health related hospitalization. This is echoed by the references above that reported that health services are not provided equitably to people with mental conditions. Other common characteristics of those with a mental condition can play a part in leading to unmet needs. For example, looking at education levels, adult respondents from the Canadian Community Health Survey Cycle 1.2 who had an anxiety or depressive disorder were more likely to see a psychiatrist, family doctor, psychologist or social worker the higher their education.[90] Thus, socially disadvantaged individuals were at high risk for having their mental health service needs unmet. Steele (2007) suggested that programs for targeted services be developed and evaluated for consumers who have not completed high school.[91]

In summary, mental conditions can affect any age group, and are a common comorbidity for physical disorders. Our report emphasizes comorbid mental conditions. We found those hospitalized with a diagnosis of a mental condition used 29% of hospital days in 2003/2004, and that more than half of these days were associated with a mental comorbidity. Also, the average length of stay for those hospitalizations with a mental comorbidity was two times the length of stay for hospitalizations without one. A linked survey/hospital study identified a set of characteristics associated with those hospitalized with a comorbid diagnosis of a mental condition. The characteristics, such as smoking, low income, low education, and the presence of physical conditions, are also often associated with increased use of hospital services: they may be associated with greater use of services by the mental patient population. Future work plans to bring together the two sides of this study by examining to what extent factors associated with a diagnosed mental condition could contribute to longer average lengths of hospital stay.

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Appendix

Table A
Mental disorders, conditions, and ICD-9 and ICD-10-CA codes

Disorders	Conditions	ICD-9 code	ICD-10-CA code
Organic disorders	Senile and pre-senile psychotic conditions	290.0–290.9	F00–F09, G30
	Transient organic psychotic conditions	293.0, 293.1, 293.8, 293.9	
	Other organic psychotic conditions	294.0, 294.1, 294.8, 294.9	
Substance-related disorders	Alcoholic psychoses	291.0–291.9	F10–F19, F55
	Drug psychoses	292.0–292.9	
	Alcohol dependence	303.0–303.9	
	Drug dependence	304.0–304.9	
	Nondependent abuse of drugs	305.0–305.9	
Schizophrenic/ Psychotic disorders	Schizophrenia	295.0–295.9	F20–F29
	Psychotic	298.8–298.9	
	Paranoia	297.1–297.3	
Mood disorders	Bipolar	296.0–296.1, 296.4–296.8	F30, F31, F34.0
	Depression	296.2, 296.3, 300.4, 311	F32, F33, F34.1, F38.1
	Other	296.9	F34.8, F34.9, 38.0, F38.8, F39
Anxiety disorders	Anxiety	300.0, 300.2, 300.3, 309.8	F40, F41, F42, F93.0–F93.2
	Acute stress	308.3	F43.0, 43.1, 43.8, 43.9
Personality disorders	Personality disorders	301.0–301.9	F60, F61, F62, F69
Other disorders	Adjustment disorders	309.0–309.4, 309.8–309.9	F43.2, F99
	Sexual disorders	302.0–302.9	F52, F64, F65, F66
	Delusional disorders	297.0–297.3, 297.8–297.9	
	Disturbance of conduct not otherwise specified	312.0–312.4, 312.8–312.9	F63, F91, F92, F95
	Non-organic psychoses	298.0–298.4	
	All other psychiatric disorders	299.0, 299.1, 299.8, 299.9, 300.1, 300.5, 300.6, 300.7, 300.8, 300.9, 307.0, 307.1, 307.2, 307.3-307.7, 307.9, 308.0-308.2, 308.9, 310, 313.0-313.3, 313.8, 313.9, 314.0-314.2, 314.8, 314.9, 315.0-315.5, 315.9, 316, 317, 318.0-318.2, 319	F44, F48, F50, F51, F53, F54, F68, F70–F73, F84, F98, F79, F78, F80–F82, F83, F88, F89, F90, F93.3–F93.9, F94

Note: Codes under "Other Disorders" were removed if they also appeared in specific disorders above.
Source: Canadian Institute for Health Information, *Hospital Mental Health Services in Canada, 2005-2006* Ottawa 2007, p. 27-28.

Table B
Selected hospital information by most responsible or comorbid mental diagnosis and health region, all ages, Canada, 2003/2004

Health region number in 2007	Province and name of health region	Estimated population	Number of days associated with a most responsible mental diagnosis per 100 population	Number of days associated with a comorbid mental diagnosis per 100 population	Hospitalizations			Hospital days			Mean number of days per hospitalization			Ratio of average length of stay of hospitalizations with and without a comorbid mental diagnosis
					Total number of hospitalizations	Percent of hospitalizations with a most responsible mental diagnosis	Percent of hospitalizations with a comorbid mental diagnosis	Total number of hospital days	Percent of hospital days with a most responsible mental diagnosis	Percent of hospital days with a comorbid mental diagnosis	With a most responsible mental diagnosis	With a comorbid mental diagnosis	with no mental diagnosis	
	Newfoundland and Labrador													
1011	Eastern Regional	293,682	4.0	6.8	26,037	2.5	3.6	200,765	5.9	10.0	17.8	21.7	6.9	3.1
1012	Central Regional	95,607	10.4	5.3	12,009	4.0	2.4	85,796	11.6	5.9	20.9	17.5	6.3	2.8
1013	Western Regional	79,034	13.5	9.2	9,211	6.0	3.1	92,220	11.6	7.9	19.4	25.3	8.9	2.9
1014	Labrador-Grenfell Region	37,146	4.8	4.3	5,266	5.1	2.2	29,473	6.1	5.4	6.6	13.8	5.3	2.6
	Prince Edward Island													
1101	Kings County	18,608	10.9	8.8	2,836	7.8	3.8	23,080	8.8	7.1	9.2	15.3	7.7	2.0
1102	Queens County	72,744	7.9	12.6	7,444	8.3	5.9	62,565	9.2	14.6	9.3	20.9	7.5	2.8
1103	Prince County	44,499	12.5	8.9	5,555	9.6	5.0	41,061	13.5	9.7	10.4	14.4	6.6	2.2
	Nova Scotia													
1201	Zone 1	119,175	8.5	11.9	12,767	4.7	6.0	109,267	9.3	12.9	16.9	18.6	7.5	2.5
1202	Zone 2	81,473	4.4	11.0	7,448	2.6	6.0	57,089	6.3	15.7	18.4	20.1	6.5	3.1
1203	Zone 3	104,470	6.3	8.8	11,147	3.8	5.8	81,095	8.1	11.3	15.6	14.1	6.5	2.2
1204	Zone 4	91,332	7.7	11.5	10,586	5.3	6.0	78,603	9.0	13.4	12.1	16.0	6.3	2.5
1205	Zone 5	125,373	14.0	16.4	16,893	6.2	8.3	141,319	12.4	14.6	16.6	14.7	7.2	2.1
1206	Zone 6	391,639	6.6	8.3	25,810	3.3	4.2	232,254	11.2	13.9	30.7	29.8	7.3	4.1
	New Brunswick													
1301	Region 1	191,860	10.9	11.8	21,601	5.9	6.9	163,847	12.7	13.8	16.3	15.1	6.4	2.4
1302	Region 2	169,765	10.3	13.2	16,556	3.7	4.6	150,242	11.7	14.9	28.7	29.5	7.3	4.1
1303	Region 3	165,725	8.1	11.5	19,641	4.3	8.6	135,952	9.9	14.0	15.8	11.3	6.1	1.9
1304	Region 4	50,092	14.9	10.1	7,409	9.9	4.7	55,036	13.5	9.2	18.2	14.5	6.7	2.2
1305	Region 5	27,755	25.7	16.1	5,459	8.4	6.6	43,084	16.6	10.4	15.6	12.5	6.8	1.8
1306	Region 6	78,948	13.0	10.5	11,877	6.9	6.4	79,669	12.9	10.4	12.6	10.9	5.9	1.8
1307	Region 7	45,852	14.2	9.3	7,982	5.7	3.9	51,904	12.5	8.2	14.2	13.6	5.7	2.4
	Québec													
2401	Bas-Saint-Laurent	200,653	12.7	23.5	21,085	7.0	17.4	181,406	14.0	26.0	17.1	12.9	6.8	1.9
2402	Saguenay/Lac-Saint-Jean	272,610	10.1	23.9	30,334	4.8	14.2	247,663	11.1	26.4	18.8	15.1	6.3	2.4
2403	Capitale-Nationale	661,060	11.4	17.6	53,149	6.0	14.3	484,096	15.6	24.0	23.5	15.3	6.9	2.2
2404	Mauricie et du Centre-du-Québec	483,128	10.3	18.4	46,325	5.4	15.9	375,214	13.3	23.7	19.9	12.1	6.5	1.9
2405	Estrie	298,779	13.5	14.4	28,218	5.6	13.6	230,240	17.5	18.7	25.5	11.2	6.4	1.7
2406	Montréal	1,854,442	10.1	18.3	136,241	4.8	15.5	1,319,876	14.1	25.7	28.7	16.0	7.3	2.2
2407	Outaouais	341,096	8.7	15.9	20,476	7.1	16.2	197,974	15.0	27.3	20.4	16.3	7.3	2.2
2408	Abitibi-Temiscamingue	143,872	8.7	21.3	15,204	6.2	16.1	113,674	11.0	27.0	13.4	12.6	6.0	2.1
2409	Côte-Nord	95,911	16.4	20.3	11,363	7.2	14.4	89,113	17.7	21.9	19.3	11.9	6.0	2.0
2410	Nord-du-Québec	14,871	7.2	17.5	1,712	6.5	15.4	11,558	9.3	22.5	9.6	9.9	5.9	1.7
2411	Gaspésie/Îles-de-la-Madeleine	94,336	8.7	22.1	12,046	4.7	18.6	86,222	9.6	24.2	14.7	9.3	6.2	1.5
2412	Chaudière-Appalaches	393,669	11.4	15.5	35,754	7.6	14.7	269,008	16.7	22.7	16.5	11.6	5.9	2.0
2413	Laval	368,709	9.2	15.9	27,550	5.3	13.9	238,116	14.2	24.6	23.1	15.3	6.5	2.3
2414	Lanaudière	429,053	9.5	15.3	31,836	6.8	14.7	269,236	15.1	24.4	18.6	14.0	6.5	2.1
2415	Laurentides	511,276	9.2	18.6	45,353	5.3	17.6	358,629	13.2	26.5	19.5	11.9	6.2	1.9
2416	Montérégie	1,357,720	9.9	15.7	108,141	5.8	14.0	914,953	14.7	23.3	21.4	14.1	6.5	2.1
2417	Nunavik	10,815	11.8	12.7	1,729	6.0	10.3	10,146	12.6	13.6	12.4	7.7	5.2	1.5
2418	Terres-Cries-de-la-Baie-James	14,131	8.0	13.4	2,067	5.9	10.3	12,199	9.3	15.6	9.3	9.0	5.3	1.7
	Ontario													
3501	Erie St. Clair	630,195	7.2	5.2	59,407	6.5	5.5	354,865	12.8	9.3	11.7	10.1	5.3	1.9
3502	South West	901,123	6.2	5.6	79,278	6.0	5.9	489,494	11.4	10.2	11.8	10.7	5.5	2.0
3503	Waterloo Wellington	686,324	4.3	4.7	51,323	5.3	5.1	301,304	9.7	10.6	10.7	12.2	5.2	2.3
3504	Hamilton Niagara Hald	1,315,964	5.9	6.9	117,283	4.9	5.5	788,120	9.9	11.6	13.6	14.1	5.9	2.4
3505	Central West	739,957	4.0	3.6	49,402	4.8	3.9	284,528	10.3	9.3	12.5	13.7	5.1	2.7
3506	Mississauga Halton	1,008,004	3.7	3.7	62,338	4.6	4.5	374,247	9.9	9.9	12.8	13.3	5.3	2.5
3507	Toronto Central	1,090,301	6.6	8.8	74,391	6.3	8.1	564,235	12.8	17.1	15.5	15.9	6.2	2.6
3508	Central	1,532,649	3.6	4.7	90,660	4.4	4.7	597,807	9.1	12.2	13.6	17.2	5.7	3.0
3509	Central East	1,442,948	4.5	5.7	105,335	5.2	6.1	661,714	9.8	12.4	11.8	12.8	5.5	2.3
3510	South East	456,416	6.3	7.3	42,971	5.1	5.3	293,303	9.8	11.4	13.2	14.7	6.0	2.5
3511	Champlain	1,147,209	6.0	7.5	82,417	5.8	6.6	587,114	11.8	14.6	14.4	15.8	6.0	2.6
3512	North Simcoe Muskoka	422,902	4.9	5.5	39,295	5.4	5.2	238,807	8.8	9.8	9.9	11.4	5.5	2.1
3513	North East	551,691	8.7	10.2	67,512	6.5	6.2	481,292	10.0	11.7	11.0	13.3	6.4	2.1
3514	North West	234,599	7.1	9.3	27,618	6.6	6.1	187,060	8.9	11.7	9.2	13.0	6.2	2.1

Table B
Selected hospital information by most responsible or comorbid mental diagnosis and health region, all ages, Canada, 2003/2004 (continued)

Health region number in 2007	Province and name of health region	Estimated population	Number of days associated with a most responsible mental diagnosis per 100 population	Number of days associated with a comorbid mental diagnosis per 100 population	Hospitalizations			Hospital days			Mean number of days per hospitalization			Ratio of average length of stay of hospitalizations with and without a comorbid mental diagnosis
					Total number of hospitalizations	Percent of hospitalizations with a most responsible mental diagnosis	Percent of hospitalizations with a comorbid mental diagnosis	Total number of hospital days	Percent of hospital days with a most responsible mental diagnosis	Percent of hospital days with a comorbid mental diagnosis	With a most responsible mental diagnosis	With a comorbid mental diagnosis	with no mental diagnosis	
	Manitoba													
4610	Winnipeg	646,541	12.9	16.3	51,691	7.0	7.8	555,367	15.0	19.0	23.0	26.3	8.3	3.2
4615	Brandon	48,256	15.9	16.2	4,501	8.0	9.3	51,065	15.0	15.3	21.2	18.7	9.6	2.0
4620	North Eastman	40,258	6.5	8.9	4,182	3.5	5.4	29,844	8.7	12.0	17.8	16.0	6.2	2.6
4625	South Eastman	59,175	7.3	10.6	6,378	2.8	6.2	47,436	9.1	13.2	24.1	15.8	6.4	2.5
4630	Interlake	78,880	5.0	9.3	9,325	3.4	5.4	63,076	6.3	11.6	12.3	14.7	6.1	2.4
4640	Central	98,602	6.7	20.6	10,802	4.0	10.1	86,354	7.6	23.5	15.3	18.5	6.4	2.9
4645	Assiniboine	68,352	18.3	17.9	12,218	5.9	8.0	99,011	12.6	12.4	17.4	12.5	7.1	1.8
4660	Parkland	40,058	25.6	21.9	6,944	5.3	7.7	59,603	17.2	14.7	28.1	16.4	6.7	2.4
4670	Norman	23,040	8.1	4.9	2,943	7.6	4.0	17,696	10.5	6.4	8.3	9.5	5.7	1.7
4680	Burntwood	44,316	4.4	4.8	6,438	5.0	5.8	31,963	6.1	6.7	6.1	5.7	4.9	1.2
	Saskatchewan													
4701	Sun Country RHA	51,316	5.5	7.0	9,963	3.2	5.3	52,190	5.5	6.9	8.8	6.8	5.0	1.4
4702	Five Hills RHA	51,868	8.7	5.9	8,212	6.0	3.6	46,222	9.8	6.6	9.2	10.2	5.2	2.0
4703	Cypress RHA	41,785	8.3	8.4	5,549	5.0	3.9	40,080	8.6	8.8	12.4	16.5	6.5	2.5
4704	Regina Qu'Appelle RHA	236,357	7.7	7.3	25,373	4.9	5.8	158,199	11.5	10.9	14.6	11.6	5.4	2.1
4705	Sunrise RHA	53,600	3.4	13.0	11,059	2.3	7.7	66,850	2.7	10.4	7.1	8.2	5.8	1.4
4706	Saskatoon RHA	281,227	6.2	7.7	27,905	4.6	5.9	185,757	9.5	11.7	13.7	13.1	5.9	2.2
4707	Heartland RHA	40,960	4.2	5.7	6,004	3.3	4.7	33,578	5.1	6.9	8.6	8.3	5.3	1.5
4708	Kelsey Trail RHA	39,866	2.9	12.5	6,263	2.4	7.7	39,295	2.9	12.6	7.5	10.3	5.9	1.7
4709	Prince Albert Parkland RHA	73,487	1.7	5.4	9,310	1.4	4.0	53,696	2.3	7.4	9.8	10.6	5.5	1.9
4710	Prairie North RHA	65,364	1.9	7.9	9,642	2.1	6.6	49,297	2.5	10.5	5.9	8.1	4.9	1.7
4711	Mamawetan Churchill RHA	19,569	0.8	3.2	2,148	2.6	4.7	9,282	1.6	6.8	2.7	6.2	4.3	1.5
4712	Keewatin Yatthé RHA	10,512	1.9	2.6	1,055	3.3	3.3	5,333	3.8	5.1	5.8	7.7	4.9	1.6
4713	Athabasca Health Authority	2,246	0.6	2.1	274	3.3	4.4	1,033	1.3	4.5	1.5	3.9	3.8	1.0
	Alberta													
4821	Chinook Regional Health	154,461	12.7	18.0	17,389	7.1	11.1	124,535	15.7	22.4	15.8	14.4	5.4	2.7
4822	Palliser Health Region	101,020	14.0	20.5	13,289	7.9	12.9	95,552	14.8	21.7	13.5	12.1	5.8	2.1
4823	Calgary Health Region	1,206,930	7.6	9.1	82,278	6.3	8.3	586,956	15.6	18.6	17.7	16.0	5.5	2.9
4824	David Thompson Region	298,766	8.7	15.0	37,991	4.0	8.8	263,001	9.9	17.1	16.9	13.5	5.8	2.3
4825	East Central Health	110,905	8.2	15.8	15,252	5.6	9.7	100,336	9.1	17.5	10.6	11.9	5.7	2.1
4826	Capital Health	1,036,813	6.0	12.8	73,849	4.7	11.4	533,755	11.7	24.9	18.0	15.8	5.5	2.9
4827	Aspen Regional Health	172,819	6.9	9.3	23,790	5.2	6.7	139,045	8.6	11.6	9.6	10.1	5.3	1.9
4828	Peace Country Health	135,336	8.2	8.9	17,085	6.3	7.6	93,271	12.0	13.0	10.4	9.3	4.8	2.0
4829	Northern Lights Health	73,290	5.4	4.6	7,713	4.6	5.0	38,339	10.3	8.9	11.1	8.8	4.4	2.0
	British Columbia													
5911	East Kootenay	74,663	7.8	5.6	7,875	6.8	4.8	44,386	13.1	9.4	10.9	11.1	4.9	2.2
5912	Kootenay/Boundary	73,665	8.2	6.9	10,273	6.7	5.0	57,091	10.6	8.9	8.7	9.9	5.1	2.0
5913	Okanagan	319,052	6.2	6.9	31,700	7.3	5.6	195,814	10.0	11.3	8.5	12.4	5.6	2.2
5914	Thompson/Cariboo	208,333	6.4	8.3	20,223	6.5	7.7	125,720	10.6	13.7	10.2	11.1	5.5	2.0
5921	Fraser East	256,211	6.6	3.9	22,624	7.2	2.5	144,454	11.7	6.9	10.4	17.7	5.8	3.1
5922	Fraser North	544,285	7.6	8.5	39,252	6.8	5.2	299,127	13.8	15.4	15.5	22.6	6.1	3.7
5923	Fraser South	630,430	6.4	5.9	43,193	5.8	3.8	332,040	12.1	11.3	16.1	23.0	6.5	3.5
5931	Richmond	174,461	5.4	3.5	9,448	6.4	3.4	66,595	14.2	9.1	15.7	18.7	6.0	3.1
5932	Vancouver	589,058	11.1	10.9	37,022	10.3	10.7	317,524	20.6	20.3	17.0	16.3	6.4	2.5
5933	North Shore/Coast Garibaldi	260,013	6.1	6.3	18,807	6.3	6.0	133,749	12.0	12.2	13.6	14.4	6.2	2.3
5941	South Vancouver Island	345,164	19.0	15.4	31,393	7.6	7.1	280,390	23.5	19.0	27.4	23.7	6.0	3.9
5942	Central Vancouver Island	246,583	8.4	7.6	25,185	6.1	5.8	163,778	12.6	11.5	13.5	12.8	5.6	2.3
5943	North Vancouver Island	114,594	9.8	13.4	11,579	6.8	9.6	75,692	14.8	20.3	14.2	13.8	5.1	2.7
5951	Northwest	73,830	7.6	6.8	7,643	9.3	6.8	43,319	12.9	11.6	7.9	9.6	5.1	1.9
5952	Northern Interior	139,711	10.1	8.7	16,170	6.7	7.8	98,101	14.4	12.4	13.0	9.6	5.2	1.8
5953	Northeast	63,434	9.3	6.4	5,667	8.7	7.6	33,555	17.5	12.1	11.9	9.3	5.0	1.9
	Territories													
6001	Yukon	30,372	4.4	6.6	2,356	8.3	9.0	12,349	10.7	16.3	6.8	9.5	4.6	2.1
6101	Northwest Territories	41,464	7.3	3.2	4,376	12.2	5.7	18,564	16.2	7.1	5.7	5.3	4.0	1.3
6201	Nunavut	29,474	2.9	0.6	1,963	6.2	2.2	7,529	11.4	2.3	7.1	4.1	3.6	1.1
Total		**31,611,964**	**7.7**	**10.3**	**2,695,311**	**5.4**	**7.9**	**19,735,116**	**11.9**	**15.4**	**16.1**	**14.3**	**6.1**	**2.3**

Note: Includes all ages but excludes 16,220 records that could not be assigned to a health region.
Source: 2003/2004 Hospital Person-Oriented Information.

Table C
Characteristics of hospitalizations with a comorbid mental diagnosis by major disease types (ICD-10-CA chapter) and age group, Canada excluding Manitoba and Quebec, 2003/2004

		% of hospitalizations in chapter					Total number of hospitalizations					% of chapter hospitalizations with a mental comorbidity				
	ICD-10-CA chapter	0 to 19	20 to 39	40 to 64	65 or older	Total	0 to 19	20 to 39	40 to 64	65 or older	Total	0 to 19	20 to 39	40 to 64	65 or older	Total
	All chapters	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**197,424**	**443,950**	**501,168**	**709,495**	**1,852,037**	**2.4**	**3.5**	**6.8**	**9.8**	**6.7**
1	Infectious, parasitic	5.1	0.8	1.3	1.4	1.6	10,007	3,741	6,489	9,780	30,017	1.2	11.0	11.9	14.1	8.9
2	Neoplasm	1.3	2.4	12.2	9.5	7.6	2,603	10,677	60,895	67,174	141,349	2.3	1.7	3.0	5.2	3.9
3	Blood	1.6	0.4	1.0	1.2	1.0	3,212	1,660	4,951	8,546	18,369	1.7	5.2	6.3	8.3	6.3
4	Metabolic	2.8	1.4	2.9	2.9	2.5	5,435	6,327	14,725	20,480	46,967	4.1	10.3	12.1	15.8	12.6
6	Nervous	2.3	0.9	1.9	1.6	1.6	4,459	4,188	9,310	11,283	29,240	8.7	13.0	15.5	17.9	15.0
7	Eye	0.4	0.1	0.5	0.4	0.4	888	615	2,449	2,694	6,646	1.0	2.0	1.6	2.5	1.9
8	Ear	0.9	0.2	0.3	0.3	0.3	1,798	758	1,702	1,840	6,098	1.1	2.9	3.1	6.1	3.4
9	Circulatory	1.1	1.6	16.7	25.1	14.7	2,142	7,299	83,898	178,033	271,372	3.1	8.2	5.7	7.8	7.1
10	Respiratory	24.2	2.8	6.2	11.6	9.4	47,774	12,420	30,946	82,245	173,385	1.1	7.5	12.4	13.5	9.5
11	Digestive	11.0	8.1	15.0	10.9	11.4	21,778	36,180	75,138	77,306	210,402	1.6	5.0	7.0	7.6	6.3
12	Skin	1.5	0.7	1.3	0.9	1.0	2,941	2,981	6,433	6,618	18,973	2.0	13.4	11.0	11.3	10.1
13	Musculoskeletal	2.3	2.6	7.3	6.4	5.3	4,595	11,385	36,557	45,115	97,652	2.8	3.6	3.5	5.8	4.5
14	Genitourinary	3.6	5.3	9.1	5.6	6.3	7,182	23,653	45,461	39,809	116,105	1.1	2.0	2.4	8.7	4.4
15	Pregnancy	6.9	55.0	1.7	†	14.4	13,688	244,309	8,563	†	266,561	2.0	1.1	1.2	†	1.1
16	Perinatal period	6.0	†	†	†	†	11,846	26	6	†	11,879	0.0	†	†	†	†
17	Congenital	3.6	0.2	0.2	0.0	0.5	7,079	959	1,002	328	9,368	1.2	2.7	4.1	5.8	1.8
18	Ill-defined	6.9	3.3	7.9	7.8	6.6	13,696	14,536	39,387	55,112	122,731	4.3	9.5	9.3	11.9	9.9
19	Injury/poison	13.3	7.2	9.1	8.4	8.8	26,222	31,897	45,841	59,840	163,800	5.8	14.1	12.2	14.9	12.5
20	External cause	5.1	6.8	5.4	6.1	6.0	10,052	30,216	27,224	43,228	110,720	2.2	1.8	5.7	11.7	6.7

† too low to report (less than six hospitalizations with a mental comorbid diagnosis)

Notes: This analysis uses only those records that were coded using ICD-10-CA, so the 747,510 hospitalizations from Quebec and Manitoba, coded in ICD-9 and ICD 9-CM in 2003/2004, were excluded. Observations with Most-Responsible mental diagnosis in Canada minus Quebec and Manitoba were excluded (111,986). Thus 1,852,037 or 68.3% of the hospitalizations in 2003/04 are included in this analysis (2,711,533 minus 747,510 minus 111,986). There were also 403 records included in denominator and data not shown corresponding to additional morphology.

Source: 2003/2004 Hospital Person-Oriented Information.

Table D
Percentage of hospitalizations with a comorbid mental diagnosis, by province/territory and ICD-10-CA Chapter, Canada excluding Manitoba and Quebec, 2003/2004

	ICD-10-CA chapter	Total	N.L.	P.E.I.	N.S.	N.B.	Ont.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nvt.
	All chapters	**6.7**	**3.2**	**5.7**	**6.2**	**6.7**	**6.1**	**5.9**	**9.9**	**6.7**	**3.2**	**5.7**	**6.2**
1	Infectious	8.9	3.8	5.4	7.9	6.1	8.0	5.0	12.9	12.2	3.8	5.4	7.9
2	Neoplasms	3.9	1.8	4.3	3.9	4.0	3.7	2.3	7.3	2.7	1.8	4.3	3.9
3	Blood	6.3	2.9	†	7.3	7.0	5.4	5.6	10.4	6.9	2.9	†	7.3
4	Metabolic	12.6	5.7	11.0	12.4	10.8	12.3	10.1	17.7	11.7	5.7	11.0	12.4
6	Nervous	15.0	8.0	10.8	14.7	14.7	14.7	11.0	18.2	16.0	8.0	10.8	14.7
7	Eye	1.9	†	†	†	5.0	1.3	†	2.7	2.2	†	†	†
8	Ear	3.4	†	†	1.5	3.5	2.8	6.1	6.4	1.7	†	†	1.5
9	Circulatory	7.1	3.5	6.5	6.0	7.2	6.5	6.0	12.9	6.5	3.5	6.5	6.0
10	Respiratory	9.5	3.6	6.7	9.3	7.5	9.9	5.7	13.8	8.3	3.6	6.7	9.3
11	Digestive	6.3	3.0	4.4	5.4	6.3	5.7	5.2	10.2	5.9	3.0	4.4	5.4
12	Skin	10.1	2.2	7.9	8.7	9.6	8.1	7.0	14.9	15.0	2.2	7.9	8.7
13	Musculoskeletal	4.5	2.7	4.2	3.5	5.9	3.5	3.8	8.0	4.6	2.7	4.2	3.5
14	Genitourinary	4.4	1.6	2.7	4.1	3.8	4.4	3.8	7.3	3.3	1.6	2.7	4.1
15	Pregnancy	1.1	0.5	0.7	0.4	0.7	0.6	2.4	1.6	2.0	0.5	0.7	0.4
16	Perinatal period	0.0	†	†	†	†	†	†	†	†	†	†	†
17	Congenital	1.8	4.8	†	†	2.4	1.2	2.5	2.7	2.2	4.8	†	†
18	Ill-defined	9.9	4.2	8.0	8.9	10.9	9.3	9.1	14.3	9.9	4.2	8.0	8.9
19	Injury/poison	12.5	6.1	11.8	10.6	10.3	12.0	11.6	15.6	12.9	6.1	11.8	10.6
20	Supplement	6.7	3.3	7.2	7.8	7.2	5.0	7.0	10.5	7.9	3.3	7.2	7.8

† too low to report (less than six hospitalizations with a mental comorbid diagnosis)

Notes: This analysis uses only those records that were coded using ICD-10-CA, so the 747,510 hospitalizations from Quebec and Manitoba, coded in ICD-9 and ICD-9-CM in 2003/2004, were excluded. Observations with Most-Responsible mental diagnosis in Canada minus Quebec and Manitoba were excluded (111,986). Thus 1,852,037 or 68.3% of the hospitalizations in 2003/04 are included in this analysis (2,711,533 minus 747,510 minus 111,986). There were also 403 records included in denominator and data not shown corresponding to additional morphology.

Source: 2003/2004 Hospital Person-Oriented Information.

Table E
Percentage of hospital days with a comorbid mental diagnosis, by province/territory and ICD-10-CA Chapter, Canada excluding Manitoba and Quebec, 2003/2004

	ICD-10-CA chapter	Total	N.L.	P.E.I.	N.S.	N.B.	Ont.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nvt.
	All chapters	**15.3**	**9.1**	**13.1**	**15.3**	**14.7**	**13.4**	**10.7**	**22.4**	**16.5**	**15.1**	**9.1**	**13.1**
1	Infectious	20.3	12.2	11.3	20.3	15.2	17.6	10.9	28.5	28.3	20.7	12.2	11.3
2	Neoplasms	9.0	5.2	9.5	9.0	8.4	8.5	4.3	15.6	8.2	9.1	5.2	9.5
3	Blood	13.9	8.1	†	13.9	9.2	9.5	8.7	19.2	13.4	11.5	8.1	†
4	Metabolic	18.9	12.3	23.2	18.9	24.7	21.2	16.4	31.0	23.1	22.4	12.3	23.2
6	Nervous	37.4	17.4	25.5	37.4	31.9	27.1	14.8	37.6	32.4	29.2	17.4	25.5
7	Eye	†	†	†	†	8.8	4.2	†	6.4	17.1	6.5	†	†
8	Ear	3.5	†	†	3.5	9.8	6.3	7.9	12.0	4.5	7.2	†	†
9	Circulatory	14.0	9.3	13.3	14.0	12.2	12.4	9.7	23.6	16.2	14.2	9.3	13.3
10	Respiratory	19.9	12.5	15.2	19.9	14.6	18.6	11.1	26.9	17.1	18.7	12.5	15.2
11	Digestive	11.2	8.3	9.8	11.2	11.7	11.2	9.4	19.4	11.9	12.4	8.3	9.8
12	Skin	16.8	4.6	20.7	16.8	19.0	14.4	12.2	26.4	23.5	18.1	4.6	20.7
13	Musculoskeletal	10.9	7.4	7.6	10.9	12.1	9.7	7.5	19.1	14.9	12.1	7.4	7.6
14	Genitourinary	12.0	7.6	5.2	12.0	11.6	12.0	8.1	19.4	11.4	12.5	7.6	5.2
15	Pregnancy	0.6	1.1	1.6	0.6	1.2	1.0	3.1	2.4	4.8	2.0	1.1	1.6
16	Perinatal period	†	†	†	†	†	†	†	†	†	†	†	†
17	Congenital	†	21.2	†	†	3.8	4.4	8.5	6.8	9.5	6.0	21.2	†
18	Ill-defined	19.4	12.8	12.3	19.4	18.3	18.7	15.1	28.0	23.4	20.3	12.8	12.3
19	Injury/poison	19.9	9.8	19.4	19.9	20.3	20.4	16.8	28.1	23.5	21.7	9.8	19.4
20	Supplement	21.7	10.2	18.8	21.7	21.2	17.0	14.8	28.7	18.3	19.6	10.2	18.8

† too low to report (less than six hospitalizations with a mental comorbid diagnosis)

Notes: This analysis uses only those records that were coded using ICD-10-CA, so the 747,510 hospitalizations from Quebec and Manitoba, coded in ICD-9 and ICD-9-CM in 2003/2004, were excluded. Observations with Most-Responsible mental diagnosis in Canada minus Quebec and Manitoba were excluded (111,986). Thus 1,852,037 or 68.3% of the hospitalizations in 2003/04 are included in this analysis (2,711,533 minus 747,510 minus 111,986). There were also 403 records included in denominator and data not shown corresponding to additional morphology.

Source: 2003/2004 Hospital Person-Oriented Information.

Table F
Ratio of average length of stay of acute care hospitalizations with and without a comorbid mental diagnosis, by province/territory and ICD-10-CA Chapter, Canada excluding Manitoba and Quebec, 2003/2004

	ICD-10-CA chapter	Total	N.L.	P.E.I.	N.S.	N.B.	Ont.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nvt.
	All chapters	**2.7**	**3.0**	**2.5**	**2.7**	**2.4**	**2.4**	**1.9**	**2.6**	**2.7**	**2.5**	**3.0**	**2.5**
1	Infectious	3.0	3.5	2.2	3.0	2.8	2.5	2.3	2.7	2.9	2.7	3.5	2.2
2	Neoplasms	2.5	3.0	2.3	2.5	2.2	2.4	1.9	2.4	3.3	2.5	3.0	2.3
3	Blood	2.0	2.9	†	2.0	1.3	1.9	1.6	2.0	2.1	1.9	2.9	†
4	Metabolic	1.7	2.3	2.4	1.7	2.7	1.9	1.8	2.1	2.3	2.0	2.3	2.4
6	Nervous	3.5	2.4	2.8	3.5	2.7	2.2	1.4	2.7	2.5	2.3	2.4	2.8
7	Eye	†	†	†	†	1.8	3.4	†	2.5	9.2	3.5	†	†
8	Ear	2.4	†	†	2.4	3.0	2.3	1.3	2.0	2.7	2.2	†	†
9	Circulatory	2.6	2.8	2.2	2.6	1.8	2.0	1.7	2.1	2.8	2.2	2.8	2.2
10	Respiratory	2.4	3.8	2.5	2.4	2.1	2.1	2.1	2.3	2.3	2.2	3.8	2.5
11	Digestive	2.2	2.9	2.4	2.2	2.0	2.1	1.9	2.1	2.1	2.1	2.9	2.4
12	Skin	2.1	2.2	3.0	2.1	2.2	1.9	1.9	2.0	1.7	2.0	2.2	3.0
13	Musculoskeletal	3.3	2.9	1.9	3.3	2.2	2.9	2.0	2.7	3.6	2.9	2.9	1.9
14	Genitourinary	3.2	5.0	2.0	3.2	3.3	3.0	2.3	3.1	3.8	3.1	5.0	2.0
15	Pregnancy	1.5	2.5	2.2	1.5	1.7	1.6	1.3	1.5	2.4	1.8	2.5	2.2
16	Perinatal period	†	†	†	†	†	†	†	†	†	†	†	†
17	Congenital	†	5.3	†	†	1.6	3.6	3.6	2.6	4.7	3.5	5.3	†
18	Ill-defined	2.5	3.3	1.6	2.5	1.8	2.3	1.8	2.3	2.8	2.3	3.3	1.6
19	Injury/poison	2.1	1.7	1.8	2.1	2.2	1.9	1.5	2.1	2.1	1.9	1.7	1.8
20	Supplement	3.3	3.4	3.0	3.3	3.5	3.9	2.3	3.5	2.6	3.4	3.4	3.0

† too low to report (less than six hospitalizations with a mental comorbid diagnosis)

Notes: This analysis uses only those records that were coded using ICD-10-CA, so the 747,510 hospitalizations from Quebec and Manitoba, coded in ICD-9 and ICD-9-CM in 2003/2004, were excluded. Observations with Most-Responsible mental diagnosis in Canada minus Quebec and Manitoba were excluded (111,986). Thus 1,852,037 or 68.3% of the hospitalizations in 2003/04 are included in this analysis (2,711,533 minus 747,510 minus 111,986). There were also 403 records included in denominator and data not shown corresponding to additional morphology.

Source: 2003/2004 Hospital Person-Oriented Information.

Table G
Percentage of acute care hospitalizations with a mental comorbid diagnosis, by ICD-10-CA chapter and type of mental comorbidity, Canada excluding Manitoba and Quebec, 2003/2004

ICD-10-CA chapter		Total number of hospitalizations ('000s)	Type of mental disorder							
			Organic	Substance-related	Psychotic	Mood	Anxiety	Personality	Other	Any mental
	All chapters	**1,852**	**2.5**	**1.7**	**0.3**	**1.5**	**0.8**	**0.2**	**0.5**	**6.7**
1	Infectious, parasitic	30	3.8	2.5	0.3	1.9	0.6	0.1	0.7	8.9
2	Neoplasms	141	1.5	0.7	0.3	1.0	0.5	0.0	0.2	3.9
3	Blood	18	2.4	1.6	0.3	1.5	0.6	0.1	0.5	6.3
4	Metabolic	47	4.8	2.9	0.7	3.3	1.0	0.3	1.0	12.6
6	Nervous	29	5.5	3.7	0.6	3.2	1.5	0.3	2.1	15.0
7	Eye	7	0.6	0.3	0.2	0.4	0.3	†	0.3	1.9
8	Ear	6	0.5	0.3	0.1	1.1	1.1	†	0.5	3.4
9	Circulatory	271	3.3	1.5	0.3	1.5	0.9	0.1	0.3	7.1
10	Respiratory	173	4.1	2.0	0.5	1.8	1.3	0.1	0.6	9.5
11	Digestive	210	1.7	2.5	0.2	1.3	0.7	0.1	0.4	6.3
12	Skin	19	2.7	4.1	0.5	2.2	0.7	0.4	0.6	10.1
13	Musculoskeletal	98	1.4	0.9	0.2	1.4	0.7	0.1	0.3	4.5
14	Genitourinary	116	2.4	0.5	0.2	1.1	0.3	0.1	0.2	4.4
15	Pregnancy	267	0.0	0.5	0.0	0.3	0.2	0.0	0.2	1.1
16	Perinatal period	12	†	†	†	†	†	†	†	†
17	Congenital	9	0.2	0.3	0.1	0.4	0.2	†	0.8	1.8
18	Ill-defined	123	3.0	2.2	0.4	2.5	2.0	0.3	0.9	9.9
19	Injury/poison	164	4.2	4.2	0.5	3.2	0.8	0.7	1.1	12.5
20	Supplement	111	3.3	1.1	0.3	1.6	0.6	0.1	0.5	6.7

† too low to report (less than six hospitalizations with a mental comorbid diagnosis)

Notes: This analysis uses only those records that were coded using ICD-10-CA, so the 747,510 hospitalizations from Quebec and Manitoba, coded in ICD 9 and ICD 9-CM in 2003/2004, were excluded. Observations with a Most-Responsible mental diagnosis in Canada minus Quebec and Manitoba were excluded (111,986). Thus 1,852,037 or 68.3% of the hospitalizations in 2003/04 are included in this analysis (2,711,533 minus 747,510 minus 111,986). There were also 403 records included in denominator and data not shown corresponding to additional morphology. The "Any mental comobidity" percentage is lower than the sum of the seven categories as some hospitalizations reported more than one mental condition.

Source: 2003/2004 Hospital Person-Oriented Information.